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Model 11000
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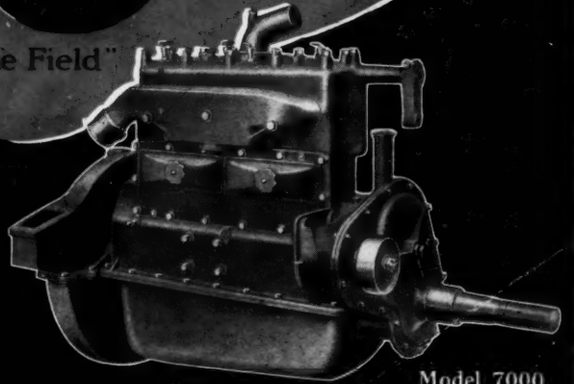

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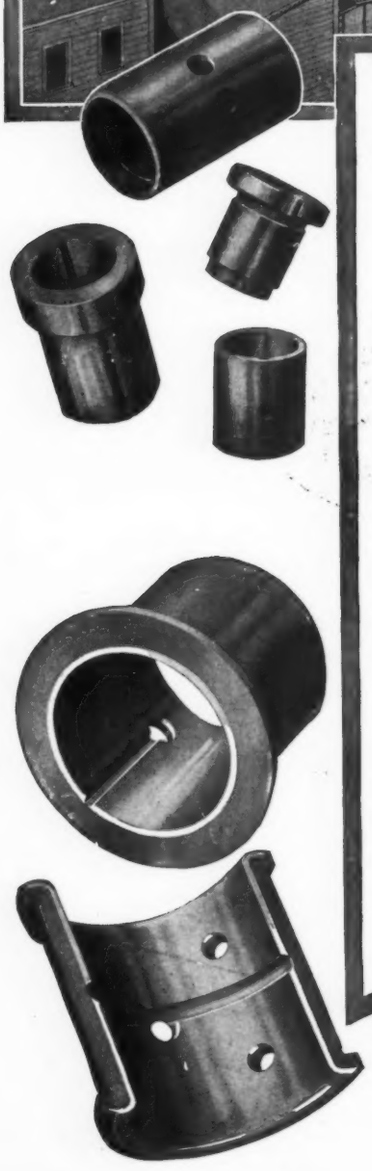

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AUTOMOTIVE INDUSTRIES
The AUTOMOBILE

VOL. XLII NEW YORK--THURSDAY, APRIL 15, 1920 No. 16

The Airplane and Automobile in Germany To-day

The status of the automotive industry in that enemy country has been more or less clouded since the armistice suspended hostilities. But competition from German makers may come in 1921, although the present conditions are shrouded in mystery.

By W. F. Bradley

PARIS, March 27.

ACCORDING to a member of the French technical mission now in Germany, the aerial activities of our late enemies have been greatly exaggerated. This mission, which is under the control of an English general, has as its chief of section Colonel Dorand, formerly head of the technical section of the French Air Service. Members of the mission are engineers from French aviation factories.

Soon after the armistice Germany tried to avoid the peace conditions by the formation of numerous aerial navigation companies, each of which secured a number of military planes and, in order to give their scheme an appearance of legality, mapped out routes and advertised civil services extensively. This plan was frustrated, however, by the technical commission, which has power to examine all machines and to condemn those suitable for military use.

Germany is no longer manufacturing planes. During the war the aviation industry was considerably developed, all the existing factories being increased in size and a large amount of work being given to non-specialized outside firms. With the armistice all these firms returned to their former occupations, or to new work, such as the construction of tractors, house furniture, automobiles, etc.

While there is no military aviation in Germany at the present time, this member of the technical commission is of the opinion that Germany could regain its former military power in the air within three months. This would only be possible, however, at great financial cost and, as all the Allied nations could return to their war basis in the same length of time, Germany does not possess any particular advantage.

PARIS, March 25.

OUT of 60 German automobile factories, only 15 are in production at the present time, declares André Laurent in an article published in *l'Automobile* of Brussels. Out of these 15, only the 4 most important firms have been able to get the necessary amount of supplies and raw material to increase their output above that of pre-war days.

The German automobile factories are unable to meet the home demand. This does not prevent them, however, from sending their products to Holland, India, Austria, the Scandinavian countries and, particularly, Russia, where they are able to obtain in exchange gold and platinum from the Ural under advantageous conditions. Last December Benz had 300 chassis waiting at Rotterdam for shipment to India.

The cost of German automobiles is comparatively low and it is certain that their quality is higher than in 1913. If account is taken of the rate of exchange,

their success need not cause surprise when it is learned that a 12-34 hp. car, with all the latest improvements, can be sold for 40,000 marks, and that the six-cylinder Opel, 18-50 hp., which is a successful copy of the Rolls-Royce, is sold for 70,000 marks. Shortly, a small car will be brought out at 10,000 marks.

"Owing to the great irregularity of supplies and raw material, all the manufacturers, with the exception of the small group mentioned above, are feeling their way cautiously and for the time being do not contemplate any increase in the size of their factories," the article states. "This state of affairs may change in the future, but for the moment the situation can be summarized as follows:

"1920: Apparent stagnation, projects, preparation, advertising.

"1921: An offensive, surprise, abundant production and novelties.

"The German models for 1920 are entirely on standard lines. They are the 1914 types with the addition of lighting and starting and a few improvements suggested by the war. They are fitted with detachable steel wheels, generally for 820 x 120-mm. tires.

"The carbureter is generally of French make. Gasoline pressure is obtained by a hand pump, automatic pressure having been abandoned. Lubrication is by means of a pump and splash, or, in other words, the circulating constant level type, with all the oil contained in the aluminum basechamber. The use of copper and brass is reduced to the lowest possible limits, for the present price of copper is 550 marks per kilogram. Radiators are generally V-shape. Water circulation is by pump, with the use of a fan. There is nothing special about the other parts of the chassis. Steering is always on the right.

"Bodies are all-metal and on all German cars the top is now hidden in a recess formed within the body. As an indication of the cost of motoring in Germany, it may be stated that a liter of gasoline now costs 5 marks 50 (nominally $5 per gallon), and that a 32 x 4¾-in. tire cannot be obtained for less than 1600 marks. Even at that price the quality of the rubber cannot be guaranteed. Generally German roads are in good condition, many of the main highways having been remade.

"Aerial transportation is being well developed in Germany. Landing grounds and stations are being established everywhere. There are regular airplane services between all towns of importance, and prices are reasonable. The aerial mail is no longer a novelty and for one mark it is possible to send a letter from Hamburg to Berlin. For this moderate charge the letter is taken to the airdrome by plane and delivered to its final destination by automobile, which also waits for the reply. At present this reply could be received in three hours. At the time of which we are writing, the end of 1919 and beginning of 1920, we received it in the middle of the afternoon. Several important international lines are being studied and one firm in the suburbs of Berlin is completing giant machines which will maintain a regular service between Hamburg and America, with loads of 50 tons and upwards.

"Although this matter is being kept secret, it has been possible to secure information, according to which the trans-atlantic liners are mixed machines combining all the advantages of the lighter and heavier than air types. The factory which has undertaken this task is at present busy with the manufacture of a light and non-inflammable gas invented in 1918 by Professor Schumann. It has a lifting power equal to half that of hydrogen, and it would be quite unaffected by a fire aboard the ship. This indicates that Germany, having lost her fleet, is placing her entire confidence in aerial navigation.

"The German automobile industry also has vast plans. It is now no secret that Krupp is completing tests of a gas turbine which is absolutely silent and economical. No technical details of this machine have yet been made public.

A New Type Rotary Engine

"The joint experimental departments of two important firms are completing a new type of rotary engine which is remarkably flexible, light and free from manufacturing complications. This engine, with a few modifications, may be run on kerosene. It is almost cylindrical in shape and of small overall dimensions. Cooling is assured by a double circulation of air and heat losses are slight. At the same time, work is being advanced on the transmission and intermediate parts. For trucks, electric transmission will be used, and for passenger cars hydraulic transmission, both of these making possible a saving of 40 per cent of power for a given efficiency. Although the two principles are different, the object is the same, namely the suppression of the change speed mechanism and of the differential, while giving to the driver a braking system which is flexible and does not transmit any strain to the mechanism of the car.

"The chassis is extremely low and the rear wheels have independent drive. The machine is to be produced as a 10-hp. model and will enable a saving of 60 per cent to be made on the labor necessary for its construction, compared with a 13-18-hp. car of standard type. It will weigh

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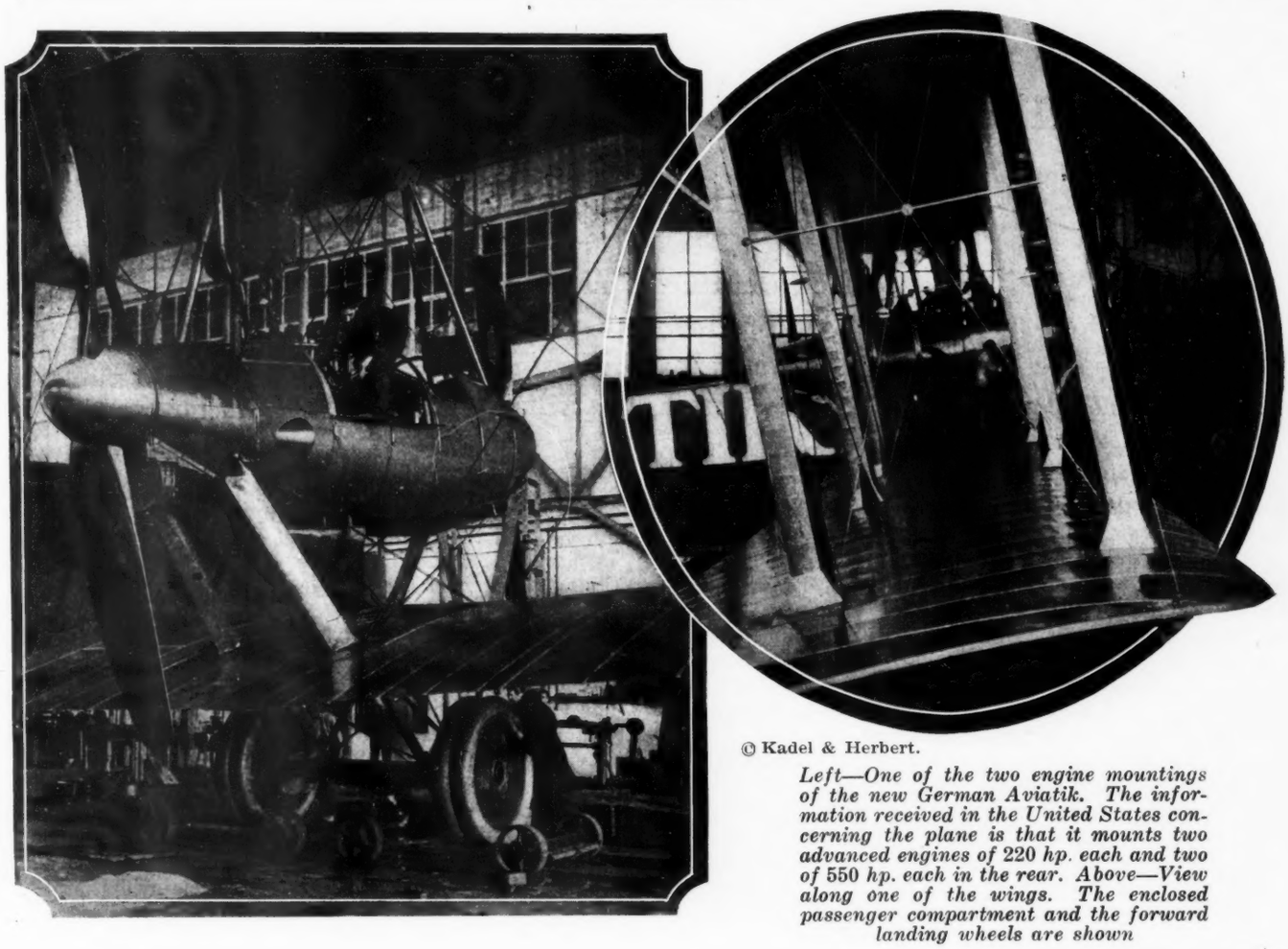
The new 22-passenger Aviatik, the largest machine of German construction. This view shows it on its first flight, carrying a full complement of passengers and baggage. Only incomplete details of its construction have been received in America



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Left—One of the two engine mountings of the new German Aviatik. The information received in the United States concerning the plane is that it mounts two advanced engines of 220 hp. each and two of 550 hp. each in the rear. Above—View along one of the wings. The enclosed passenger compartment and the forward landing wheels are shown

complete 880 lb., and will cost only half as much as an ordinary machine.

"Experiments with artificial rubber are now approaching success. After having overcome the rapid oxidization of synthetic rubber by the incorporation of organic and aniline basis, it has been possible to produce a substance which is almost inoxidizable, containing about 25 per cent of sulphur, and with which storage battery cases have been made. Since then it has been possible to give a sufficient amount of elasticity to this synthetic rubber by the addition of oils, the physical action of which results in a product which is hardly distinguishable from vegetable rubber and which is quite suitable for automobile tires.

"A huge plan is afloat for the construction of a speedway which will be covered with metal plates on a concrete foundation. This speedway will be 5 miles in length, and will have a width of 140 ft. It is probable that this track will be built in the neighborhood of Hanover. It is suggested that a test laboratory for engines and mechanical parts be erected near the speedway for trials of new models.

Great Secrecy Maintained

"The greatest secrecy surrounds all these plans and projects, and even in official German circles practically nothing is known about the activities of which we have just spoken. There is no doubt that German competition will be terribly severe in 1921. It is reasonable to ask what will be the attitude of Belgian, French, English and American manufacturers in view of this competition. Will they wait until they find themselves face to face with a terrible competitor who will swallow them after having hypnotized them? Or will they open their eyes and obtain a clear, healthy view of what is happening in the mist on the other side of the Rhine?"

Automatic Photographic Recorder

AN automatic photographic recorder was developed by the Engineers of the U. S. Army for the sound ranging service of the A. E. F. in France. The recorder, in conjunction with either a string galvanometer or oscillograph, will give clear, permanent and continuous records of any magnitude varying with time and which can be converted into an electric current. It is therefore believed that many industrial and laboratory applications of the apparatus will be found. It can be used to record variable currents, rapid temperature changes, pressure changes and intermittent and variable motion such as that of gasoline engine valve mechanism.

The apparatus consists of a motor-driven mechanism which exposes photographic paper or films to a spot of light or shadow and which carries the record through a developing bath and delivers it, exposed side downward, into a fixing bath outside the recorder. It is continuous in action and fully automatic, will handle any length of record and may be operated from a distance.

Prof. A. Trowbridge of Princeton University, Princeton. N. J. has been interested in the development of the device.

Features of Latest Design in New Tractor Engine

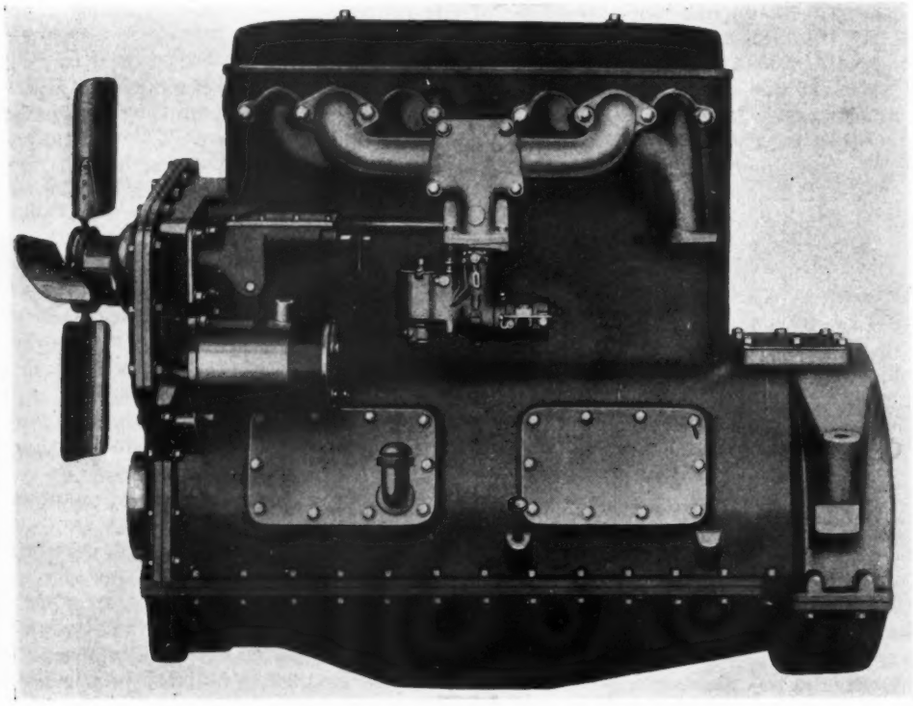
The W. S. M. powerplant, constructed on a design by Joseph Van Blerck, is a four-cylinder block type engine, with the cylinder block cast integral with the top half of the crankcase, the casting also incorporating the upper portion of the flywheel housing. It will power the W. S. M. tractor.

REFERENCE has been made previously in AUTOMOTIVE INDUSTRIES to a new tractor engine placed upon the market by the Wellman-Seaver-Morgan Co., from the designs of Joseph Van Blerck. This is a 4-cylinder, 4¾ x 6 in. block type engine, and embodies most of the features which have been recognized as desirable in tractor practice in recent years. The cylinder block is cast integral with the top half of the crankcase or, rather, the major part of the crankcase, as the joint between the upper and lower portions of the crankcase is 3½ in. below the crank axis. The upper portion of the flywheel housing is also incorporated in this casting, while the cylinder head is separate.

In accordance with late practice in tractor engine design, the cylinders are made with removable sleeves. In case of damage, a sleeve can be removed from the engine by first removing the cylinder head and then withdrawing the sleeves with a spreading tool provided for the purpose. A new sleeve can be inserted readily and, after it is in place, a tight joint is effected by means of a rubber ring in a groove in the crankcase bore through which the sleeve is pressed. The heat of the water in the jacket vulcanizes the rubber to the sleeve, thus forming a watertight joint. The sleeve is secured by a projecting shoulder against which the cylinder gasket presses when the head is in place.

Owing to the fact that the joint between the crankcase and oil sump is far below the crankshaft axis, a rigid engine block is secured. Thus, the provision of large-sized hand holes for easy access to the crankshaft and connecting-rod bearings is made possible.

The valves are located in the cylinder head and special attention has been paid to efficient cooling of the valve seats. The combustion chambers are machined all over to uniform size, and the smooth combustion chamber walls thus obtained reduce the tendency toward carbonization. Valves of a built-up type are used, the heads being made of semi-steel, which are screwed onto and electrically welded to stems of carbon steel. It is claimed that the scale, which is formed during the welding process and which is not removed from the stem, protects the latter against burning and also prevents carbon deposits. The engine is designed for three-point support, two supporting arms being cast integral with the flywheel housing and the third point of support being at the forward end, concentric with the crankshaft, a trunnion being formed on the timing gear housing cover.



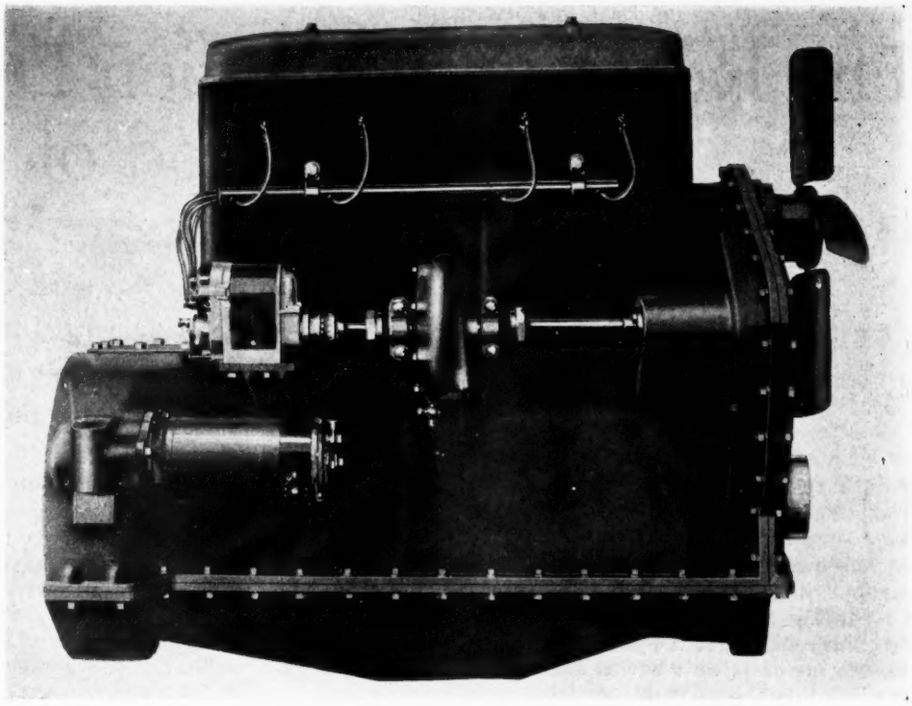
Left side of the W. S. M. engine

The crankshaft is made from a chrome nickel steel forging, heat treated. It has a diameter of 2½ in. on the main bearings and 2⅜ in. on the crankpins, the crankpins being 3 in. long each and the total length of the three main bearings being 10 1/16 in. The pistons are cast of semi-steel, are of more than the usual length and are carefully equalized in weight. The connecting rods are forged from chrome nickel steel and are heat treated. They measure 13¼ in. from center to center, considerably more than twice the length of stroke. The cap is secured in place by four ½-in. bolts of chrome nickel steel. The piston pin end of the connecting rod is fitted with a bronze bushing forming a bearing for the piston pin. An oil tube securely fastened to the rod carries oil under pressure to the piston-

pin bearing. All main and crankpin bearings are of the bronze-back, babbitt-lined type and are securely anchored in place.

The flywheel is cast of semi-steel and is machined all over. It is bored to fit a flange on the crankshaft, to which it is secured by six bolts, and has the starter gear cut integral with it. The form of the flywheel rim is changed to suit clutch requirements. The timing gears are made of steel and cast iron, with extra wide face and helical form of teeth. There are nine gears and pinions comprised in the camshaft and accessories drive, the two large gears being made of cast iron and the others of steel. The fan is assembled with its bracket as a separate unit. It is of the four-blade type, gear driven, and is lubricated by oil under pressure.

A centrifugal type of governor is fitted and is provided with an adjustment which permits of governing the engine at any speed from 1000 to 1400 r.p.m. The governor is located immediately above the generator on the left side of the engine. The exhaust and intake manifolds are of the ram's horn hot-spot type, and the engine is said to operate satisfactorily on low-grade fuel. A 1½-in. standard type carbureter is fitted and is mounted high so as to make the passage for the fuel mixture as short as possible, thus preventing recondensation.



Right side view of the W. S. M. engine

Ignition is by a single spark, high-tension magneto with impulse starter. The engine is fitted with a standard two-unit electric starting and lighting system, comprising a storage battery and, if desired, a battery ignition system can be substituted for the high-tension magneto. A starting switch, combination cut-out and ammeter are furnished as part of the electrical equipment. The starting motor is mounted on a flange on the crankcase, thus eliminating the use of mounting brackets. The generator is mounted in a similar manner on the opposite side of the engine in front. The high-tension cables of the ignition system are carried in a metal tube which is securely supported by brackets.

One of the most interesting features of the engine is the oiling system, which has been worked out with particular care. All of the main bearings are lubricated by oil under pressure and all main oil passages are 1 in. in diameter. Oil is contained in a sump in the middle of the oil pan and a bayonet type of oil gage indicates the amount of oil in the sump, the gage being located on the left-hand side of the engine, looked at from the rear. A pressure gage is mounted on the oil system beyond the sump and indicates the pressure under which oil is being fed to the bearings.

The oil pump is of the gear type and is driven at 1 1/6 times crankshaft speed (faster than customary), by a helical spur gear, direct from the main timing gears. The pump is immersed in oil and all oil drawn into it has to pass through a strainer at the bottom, which can be readily removed for cleaning. The pressure of the oil feed to the bearings is regulated by a relief valve. From the pump the oil passes through oil channels cored and drilled in the crankcase, to the main bearings, through the crankshaft to the crankpins and thence through tubes to the piston-pin bearings. Oil is also fed to the camshaft bearings under pressure and is delivered through a small hole in the end of the oil passage directly against the side of the camshaft gear. As the gear revolves, the oil is thrown off through holes in its face and automatically floods the faces of all gears in oil.

The oil is forced to the top of the engine and passes to the rocker arms through the central hole in the rocker arm shaft. Thence it passes through the rocker arm to the push rod and, after flooding the push rod, returns to the oil sump to be strained again by a fine mesh gauze before re-entering the pump. There is no outside oil piping on the engine. The crankcase communicates through the governor housing with the inlet pipe, which communicating passage serves as a breather. With an effective air cleaner on the carbureter, therefore, no dust can get into the crankcase.

The engine here described is fitted with an S. A. E. No. 2 bell housing. The Wellman-Seaver-Morgan Co. is getting out a complete line of engines based on this same

Magneto for Use with Fuel Heater

IN attacking the heavy fuel problem, automotive engineers have developed several fuel-heating devices for obtaining better vaporization. In some cases an extra ignition spark in the heating chamber is required to start and maintain the partial combustion of the fuel.

When these devices first appeared it was common practice to use a series spark plug in the heating device, leading the spark from this plug to another in one of the cylinders. Thus one spark was required to do double duty. This plan did not work out entirely satisfactory.

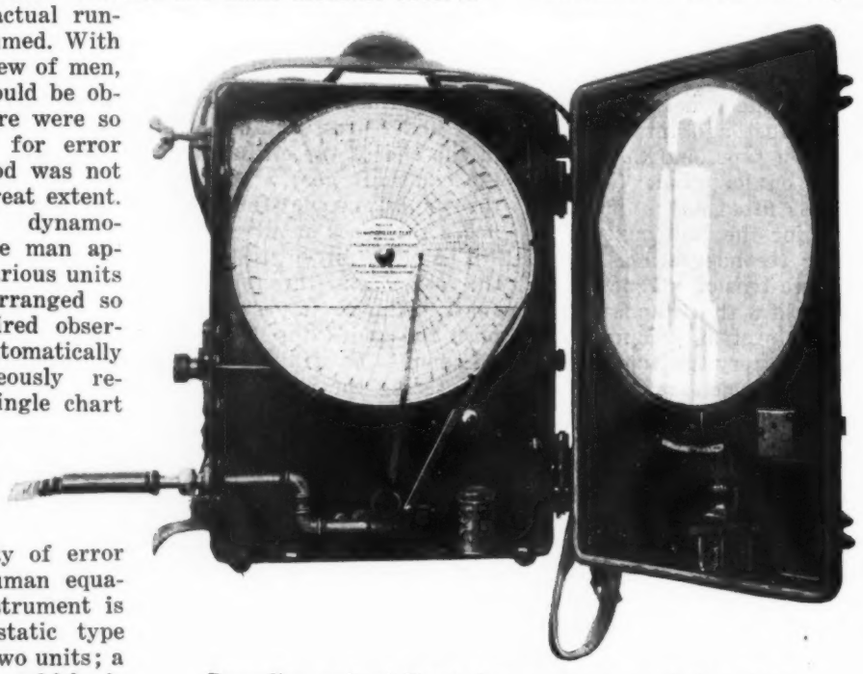
In the Splitdorf-Aero magneto only the negative sparks are utilized for cylinder ignition, and it was, therefore, a simple matter to modify the standard four-cylinder magneto to produce four sparks per revolution instead of two, and to lead the four extra positive sparks through a fifth distributor terminal to the extra spark plug in the heating chamber. This magneto, known as Splitdorf-Aero Model 480, is now in production.

The Recording Traction Dynamometer and Its Method of Use

The output on useful work of a tractor is the power delivered at the draw-bar, and the measurement of this power is the most important test that can be made of a tractor. If the test is made with the tractor pulling a plow, information is obtained not only of the output of which the tractor is capable, but also of the power required under the particular conditions.

UP to the time the Hyatt recording dynamometer was developed no thoroughly satisfactory means of testing tractors for horsepower delivered at the draw-bar was available. In order to get the net output at the draw-bar, it was necessary to use some type of spring scale or recording spring dynamometer for measuring the pull in pounds and, to get the other factors, it was necessary to measure the distance traveled and make accurate observations on the actual running time consumed. With an adequate crew of men, close results could be obtained but there were so many chances for error that the method was not used to any great extent.

The Hyatt dynamometer is a one man apparatus, the various units having been arranged so that the required observations are automatically and simultaneously recorded on a single chart which may later be analyzed and results computed with very little possibility of error due to the human equation. This instrument is of the hydrostatic type consisting of two units; a pressure unit, which is used as a hitch between the plow and the tractor, and the recording instrument, which records the draw-bar pull, the distance traveled and the elapsed time.



Recording unit of Hyatt dynamometer, consisting chiefly of a Bristol recording pressure gage

The pressure unit is always hitched between the tractor and the load to be pulled. It consists of a bronze casting which contains a rubber bag, filled with a liquid, to which the pressure is applied by a piston having an area of 10 sq. in. The draw-bar pull is transmitted to the piston by a lever having three hitch points. This gives three different ratios of draw-bar pull to pressure. The three hitches permit the dynamometer to be used in testing tractors of widely differing powers; the direct or 1:1 hitch having a maximum capacity of 3000 lb., the 2:1 hitch, 6000 lb., and the 4:1 hitch, 12,000 lb. draw-bar pull.

The recording instrument is of special design, consisting principally of a Bristol recording pressure gage. It is connected to the pressure unit by a flexible brass tube, which conveys the liquid under pressure from the rubber bag to the Bourdon spring which actuates the pen arm, thus recording the draw-bar pull on a chart mounted in the recording instrument. A needle valve, inserted in the pressure line, may be adjusted to control the flow of liquid and dampen excessive vibration of the pen.

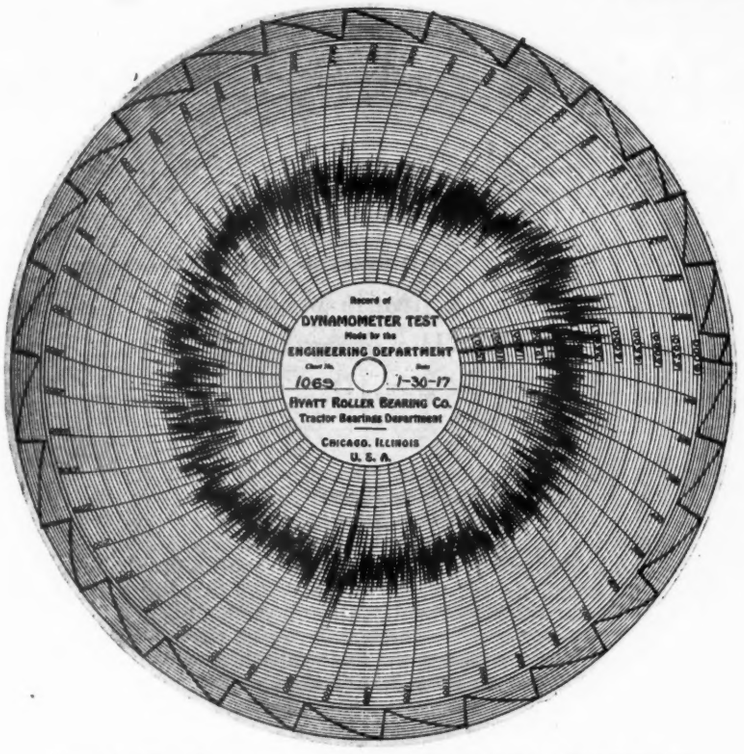
The chart is divided into spaces by a series of concentric circles, over which the pen travels, recording the draw-bar pull. With the 1:1 hitch, each space represents a pull of 250 lb., with the 2:1 hitch, 500 lb., and with the 4:1 hitch, 1000 lb.

This chart is divided about its circumference into 50 equal parts, each representing a distance traveled of 100 ft., the full chart representing a run of 5000 ft.

To record the distance traveled, a land wheel is attached to some convenient part of the tractor. The travel of this wheel is transmitted in the recording gage, which in turn rotates a shaft on which the chart is carried and causes the pressure to be recorded over a section of the chart corresponding to the distance traveled.

Another pen records the elapsed time on the annular space at the margin of the chart This space is subdivided into ten smaller spaces, each representing six seconds of time. A clock in the recorder case, fitted with a special cam, trips the time pen at one minute intervals and the fractions of a minute may be estimated by counting the number of smaller spaces over which the pen has traveled.

The dynamometer chart tells the entire story of the test. From it are obtained all data for computing the final results. The heavy fluctuating line on the chart made by the pressure pen represents the actual draw-bar pull and an average of this is obtained by tracing the line with a radii averaging instrument. The average draw-bar pull may be divided by the number of plow bottoms, if the load



Sample draw-bar pull record made by Hyatt dynamometer

was a plow, giving the pounds of draft per bottom. From the line made by the time pen at the margin of the chart the distance traveled and time consumed are determined.

Having the average draw-bar pull time and distance, the average draw-bar horsepower may be determined by the formula:

$$\frac{\text{Av. Draw-bar Pull in Lb.} \times \text{Dist. Traveled in Ft.}}{\text{Elapsed Time in Minutes} \times 33{,}000} = \text{Av. D-b. Hp.}$$

Each full diagonal line made by the time pen at the margin of the chart represents one minute of travel, and the space between any two of the short radial lines at the margin indicates the distance traveled in the corresponding minute, provided the diagonal line is unbroken. If the diagonal line is broken, the space between the corresponding radial lines represents the distance traveled for a fraction of a minute, which may be determined by counting the number of small spaces over which the pen has moved in that time.

One of the most important items to be taken into consideration, to insure a satisfactory test of a tractor, is the condition of the soil. Best results are always obtained when plowing sod and where good traction is obtainable. It is also necessary to use the right kind of grouters for the existing soil conditions. The plows should receive attention before a test run is attempted. They should be properly hitched and scour freely.

The tractor engine and tractor generally should also receive considerable attention, as follows:

Valve timing and adjustment
Timing of magneto
Motor running at rated speed
Carbureter adjustment
Clutch adjustment
Governor adjustment
Clean spark plugs
Good compression
Proper heat for vaporizing fuel
Proper fuel and lubricating oil.

To make certain that the test will do the tractor justice, sufficient load should be provided to develop its maximum sustained draw-bar pull at the rated speed. Plowing is always the most satisfactory method of testing the tractor and the load can easily be increased by sinking the plows to a greater depth. If this is not sufficient, a good plan is to add a series of disk harrows or ground pulverizers.

Weather and soil conditions may sometimes be such as to prevent plowing and then some other form of load must be substituted. A stone-boat is frequently used but it will be found more satisfactory to pull a dead tractor, the wheels of which can be locked if necessary to increase the resistance. Plowing, however, is the best test and will give the most satisfying results.

Using the Dynamometer

The use of the dynamometer in making scientific investigations of power farming problems from a technical standpoint has been wide. Much valuable information has been obtained in regard to soils and the effect of moisture on soils, the advantages of different type coulters, the comparative pull of disk and mouldboard plows, the effect of variations in depth and width of cut, of different speeds and hitches, the draft required for all kinds of farm machinery, etc.

Hyatt dynamometer in use, illustrating its one-man feature

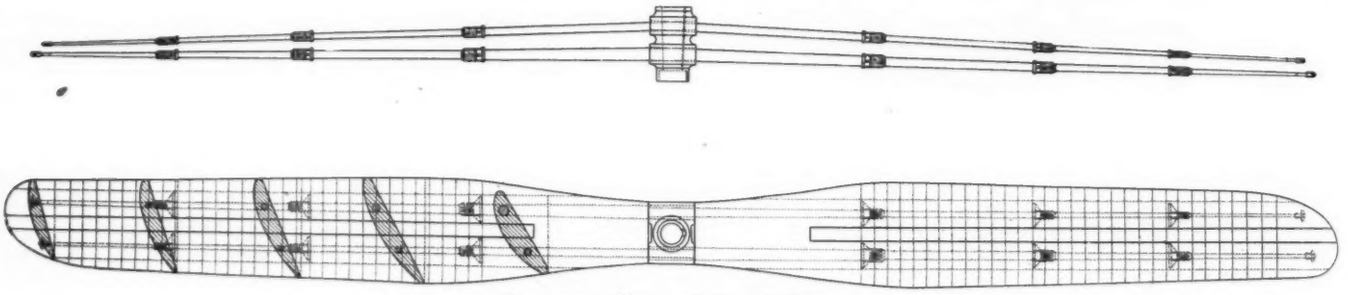
German Propeller Has Steel Core Rods with Wood Fillings

This new construction, worked out by a German engineer, has withstood rigid service tests for two years without change of profile or other deterioration, according to the claims made for it. The design is said to be especially suitable for use in tropical regions.

THE materials used for building propellers have been sheet steel and wood. Steel propellers are difficult to manufacture and have low efficiency, mainly on account of the great deformation of the blades when operating at high speed. Wood propellers are used on almost all airplanes, but they have serious drawbacks. The centrifugal force causes tremendous stresses and the reaction of the air against the blades distorts them. All these forces have a detrimental effect on the structure of a wood propeller and shorten its life. A further drawback is the tendency to warp. It often happens that an airplane which stood in the hot sun all day and remained the following night in the cool shed, cannot rise on account of a warped propeller.

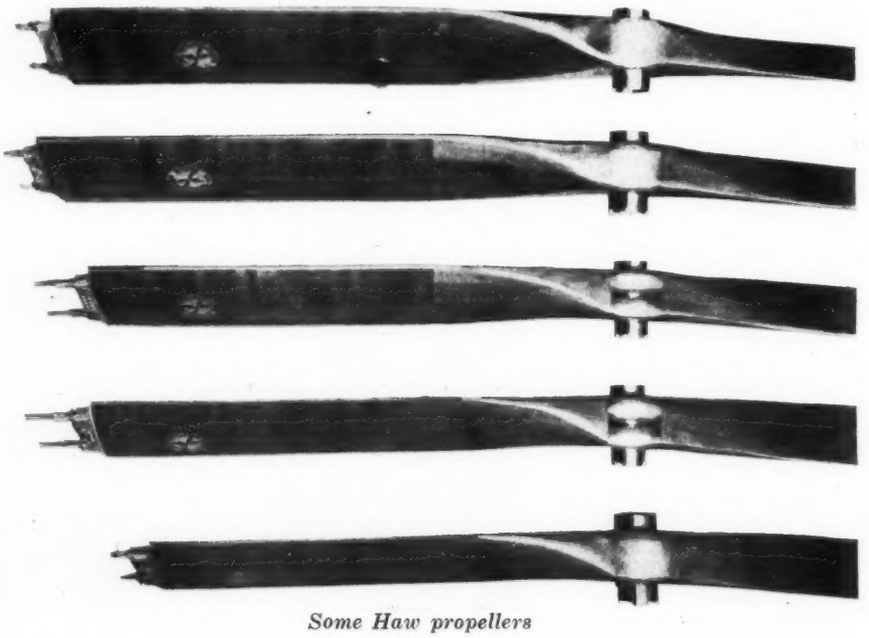
Moreover, the wood propeller requires a special hub with two circular flanges at the front and back side which are connected with screw-bolts passing right through the propeller wood. In dry weather, the whole propeller shrinks and, if the holding nuts are not screwed up in time, the propeller becomes quite loose, which has been the cause of serious accidents. On the other hand, if the nuts are screwed up tight after a long dry period and wet weather sets in, the propeller begins to swell, with the result that considerable stress is imposed on the wood. Consequently the propeller "flies off," or at least has lost its support in the hub, which causes further grave troubles.

A German engineer, Haw, has invented and built a patented design of propeller having steel core rods and fillings of wood. The drawing shows a complete propeller and its steel core; the permanent hub is a steel part bored to a taper to fit the shaft. The tail end of the propeller shaft is threaded and only one large nut serves as a fastening. The two steel rods forming the core of each blade are tapered off toward the tips and their conical inner end is pressed in the hub without thread. The wood fillings are made of ¾ in. boards cut to the right shape and drilled with two holes for threading them over the steel rods, so forming the propeller blade. The outer ends of the steel rods are threaded, and flanged nuts are screwed on and secured by riveting over, these nuts serving to compress the wood fillings. An outer wood cap in two parts is glued on, so that the shape of the Haw propeller does not differ from that of the standard propeller.

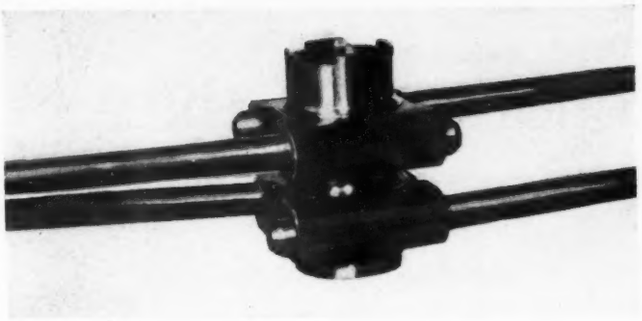


Haw propeller and its steel core

After putting on the wood fillings, but before shaping



Some Haw propellers



Steel hub with core rods

the propeller blade, grooves are provided at the sides and entering edge, which results in a greater stiffness of the propeller. Each rod of the steel core is provided at intervals with nuts which serve as thrust pieces for taking up the centrifugal forces. The inner part of the propeller blade is a solid wood piece.

The chief advantages of this new construction are that the steel core takes up all stresses and that the steel hub is solid, that is, without the six or eight bolts otherwise needed. Woods of which there is a plentiful supply can be used for the fillings, and the glueing need not be as carefully done as in regular wood propellers. Official tests made by the German Naval Board showed that the Haw propeller has a considerably longer life than the wood propeller and that no warping or twisting occurs. After two years of service under all conditions, there were no signs of deterioration or of changes of profile, and the view was expressed that "it was specially suitable for use in tropical regions." In spite of the smaller diameter of the test propellers, their efficiency was better than that of the best wood propellers. The weight of a Haw propeller is about the same as that of a wood propeller. Gunshots do only slight damage and do not incapacitate the propeller.

The same construction of propeller can be used as a fan brake. The working diameter of these brake propellers can be changed at will by removing or adding wood fillings. For endurance tests of aircraft engines, discarded airplane propellers were formerly used, and as the output of engines of the same type changes by 10 per cent, a number of brake propellers with different diameters must be kept in stock for testing. These brake propellers can also be used for testing automobile engines, but for this purpose they are built in a club form so that no axial thrust occurs.

Airship Engines

ENGINES for airships were dealt with from a design standpoint in a paper read by C. F. Abell before the British Royal Aeronautical Society. The paper was based on experience with engines fitted to British airships during the war, practically all of which were designed for use on airplanes, and the following are some of the conclusions reached and recommendations made:

The engine should have six cylinders in a single line, as this type gives greater accessibility, the exhaust piping is simpler, and the space available in a gondola of given size is greater than with a V-engine. The cylinders should be made separate and interchangeable, and the valves should be fitted in their heads and operated by overhead rockers and push rods from the camshafts. The top half of the crankcase should be provided with inspection doors on each side, to permit the big ends to be re-bedded without much difficulty; it should carry the camshafts, and the design should be such that the crankshaft journals are supported in it with bearing caps, and not in the lower half. The lower half should carry the oil pumps, but should otherwise be more or less an oil splasher. The lubrication should be on the "dry sump" system, with two drainage pumps, one at each end, in order to give efficient drainage when the ship is at a steep angle. Safety devices should be provided whereby either lack of oil pressure or excessive speed would at once stop the engine by cutting off the fuel supply at the jet.

For starting the suction pump starter, as fitted in the German airships is recommended. In it by simple mechanical means all the valves are lifted together about 3/32 in. from their seats, while the exhaust pipe is closed to the atmosphere and opened to a hand operated suction pump which draws air and gasoline from the carbureters into the cylinders. After a few strokes of this pump the valves are re-seated and the engine started by hand magneto.

The present fueling arrangements, which entail a good deal of manual labor, are unsatisfactory, being slow in operation, both in re-fueling and in trimming during flight, and definitely calling for extra men in the crew, who could be dispensed with if a more automatic system were employed. It is therefore suggested that experiments should be carried out with propeller-driven pumps, several of which could be fitted along the keel or hinged arms that would enable them to be swung into the ship when not required. The question of using kerosene as a fuel should be investigated, since it would reduce the danger of fire and be cheaper. At present a 500 hp. kerosene engine would appear unduly heavy, but for future ships of, say, 10 million cu. ft. capacity, it might be practicable to employ much heavier machinery than is now possible.

IN a lecture on "Some Obscure Points in the Theory of the Internal Combustion Engine," given last month at a meeting of the Junior Institution of Engineers, Prof. F. W. Burstall said that to sum up the present position as regards the combustion of gases in a metallic envelope, the facts would appear to show that most of the phenomena connected with "after-burning" can be explained when the variation of the specific heat with temperature is taken into consideration, but there still remains doubt as to the correctness of the statement that combustion is complete at the point of maximum temperature. Without any desire to minimize the value of the experimental work which has been done on the internal combustion engine, he feels that nearly the whole of these researches labor under a most serious drawback from the point of view of the student of thermodynamics, namely, the number of variable quantities involved is so great that it becomes almost impossible to deduce any exact laws from a series of experiments.

THE Geological Survey has issued a report on the production of aluminum in 1919, in which it states that the value of the primary aluminum produced in the United States in 1919 was $38,558,000, as compared with $41,159,000 in 1918. This decrease was probably due to curtailment of production in 1919, forced by the accumulation of large stocks of aluminum by both Government and manufacturers in 1918.

The Correct Anchorage of the Cantilever Spring

This review of European practice has been prepared by Mr. Bourdon after a careful study of English models. His comments upon design and construction should interest American engineers and builders.

By M. W. Bourdon*

IT is said that the obvious is often overlooked and this would appear to have been true in the case of certain European designers when they first adopted cantilever springs. It, therefore, occurs that the same defect in design may be in evidence in some American applications of this form of rear suspension and, possibly, as is the case in England, be causing an unwarranted condemnation of the system as a whole.

The defect in question is in regard to the method of anchoring the rear ends of the springs to the axle. Several initial attempts to lay out the various parts exhibited little, if any, consideration of the effects of spring deflection. With an enclosed propeller shaft and the torque tube anchored rigidly at the front end, so far as lateral movement was concerned, the rear end of each spring was attached by a bolt through its eye, to a lug or bracket fixed to the axle casing.

It was assumed evidently that the lengthening of the normal distance between the centers A and B, Fig. 1, would be taken up by the pivoting of the spring center on its trunnion support and the movement of the front shackled end of the spring. Imagination only can suggest the initial effect on the parts concerned when spring deflection occurred; probably the springs each assumed a double S shape in side elevation when both were deflected equally. Even imagination may fail to give a hint as to where distortion occurred when only one spring was deflected or when one was deflected more than the other. The final effects varied. In more than one case, springs fractured; in some, the torque tube was torn away from the front of the axle casing, and in others the trunnion bearing brackets at the spring centers were distorted and the spring clip bolts bent after a run on unusually bad road surfaces. In all cases, the suspension was harsh; there was a pronounced feeling on the part of the passengers that something, some part of the chassis, was not "happy," while the driver was worried by the occasionally erratic behavior of the steering control.

This question cropped up during one or two confidential discussions with officials of designing and experimental departments during the Olympia Show last November and, as a result, the various methods of anchoring cantilever springs, as exemplified on the cars exhibited, were carefully inspected. Where they were at hand, members of the technical staffs were interrogated on the point and, in a surprising number of cases, it was admitted that the defect had originally occurred in new designs. Were this not so, one would have imagined that no designer could overlook the fact that, with a torque tube head capable of no movement except that about a transverse or longitudinal axis, or both, the rear ends of cantilever springs must either be shackled to their anchorage or have sliding supports.

But this lack of consideration as to the effects of spring deflection has occurred not only in connection with the cantilever type. Certain ambulance cars and medium capacity trucks used in France by the British Army had semi-elliptic springs that were anchored by an eye-bolt to a frame bracket at one end, the other end being shackled. A torque rod was used, bolted directly to the axle casing at the rear and supported at its forward end by a link which did not allow lateral movement. When one spring was deflected more than the other, the axle assumed a position "out of square" with the chassis and endless trouble occurred, either by the torque rod working loose on the studs securing it to the axle or by the studs loosening in the axle case. If neither of these defects developed, the rod itself fractured.

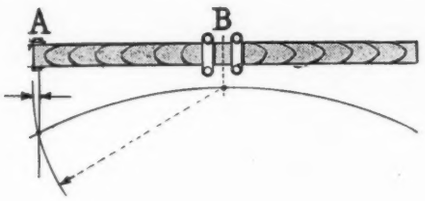
The trouble was overcome by one of two methods: (1) a link with a ball joint at each end was fitted to support the front of the rod, or (2) the rear attachment was displaced by one consisting of a hinge with a vertical axis.

The Napier company, in its post-war chassis, which has cantilever springs secured to the axle by fixed brackets and eye-bolts, has adopted the plan of supporting the forked front end of the torque tube by a pair of ball-jointed links, (Figs. 2 and 3), that end of the propeller shaft having plenty of clearance within the casing to enable relative movement to occur between the two. It is quite an "eye-opener" to ride in the back of this car with the floor-boards removed and to watch the movements of the torque tube. The extent and frequency of the lateral and longitudinal movement provide clear evidence that, with the same type of spring anchorage and no similar provision for deflection, abnormal stresses must be imposed upon the springs, axle casing, trunnion brackets and even the frame itself.

The accompanying outline sketches, Figs. 3 to 10, are the issue of the previously mentioned inspection of cantilever spring anchorages on chassis at the Olympia Show. Several of the systems thus illustrated in purely diagrammatic form found several adherents and, naturally, variations in the different principles occurred in individual cases.

It will be seen that the only example illustrated of apparent lack of consideration for spring deflection occurs in Fig. 4, a French car. Here, however, the plunging motion of the propeller shaft within the rear half of the universal joint allows for the lengthening of the distance between the joint and axle centers when both springs are deflected to the same extent. But no provision for unequal deflection would appear to have been embodied and yet freedom for the front end of the torque tube to move lat-

Mr. Bourdon is the engineering correspondent of AUTOMOTIVE INDUSTRIES *in Great Britain.*



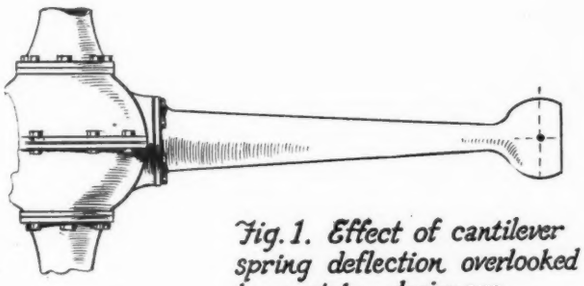


Fig. 1. Effect of cantilever spring deflection overlooked by certain designers.

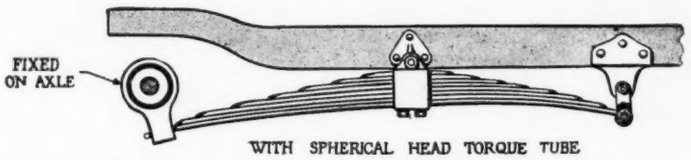


Fig. 5 Sliding support at rear end, shackles at front; exemplified on Armstrong-Siddeley in which height of front pin is adjustable in shackle plates to bring frame horizontal

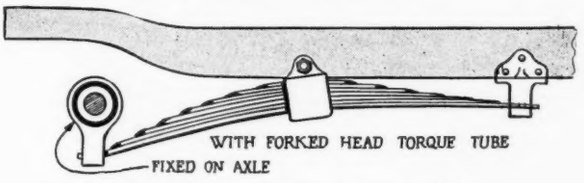


Fig 6 Sliding supports, front and rear

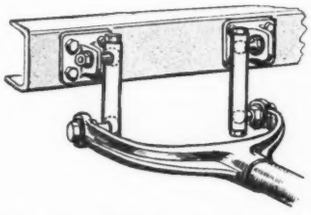


Fig. 2. Ball-ended link suspension of the forked end of torque tube on Napier

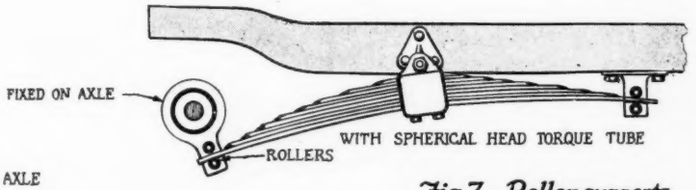


Fig. 7 Roller supports enclosed in grease retaining housings on Lanchester

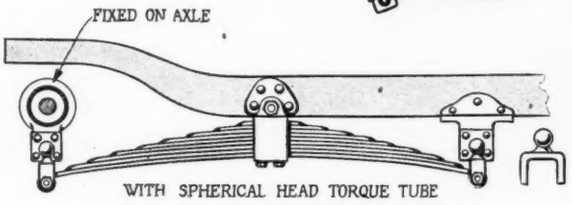


Fig 8 Ball-ended shackles on the Lorraine Dietrich

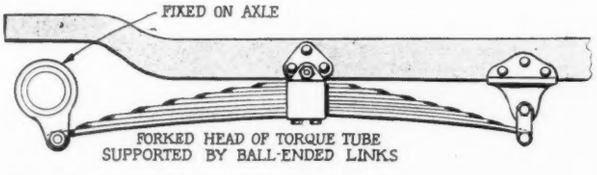


Fig. 3 The lack of rear shackles is countered by the ball-ended links of the torque tube anchorage

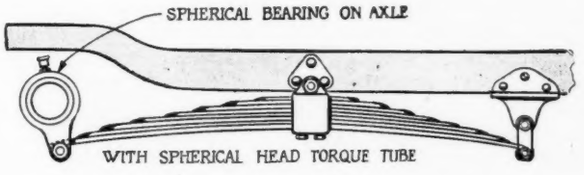


Fig 9 Ring bracket at rear end with spherical bearing on axle casing on the Charron.

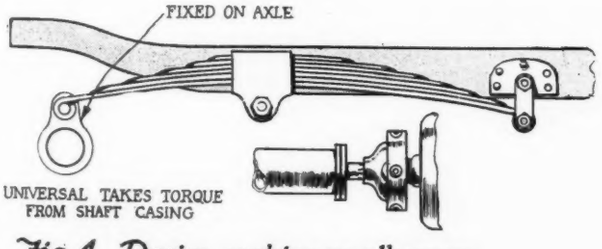


Fig. 4. Design making no allowance for unequal spring deflection.

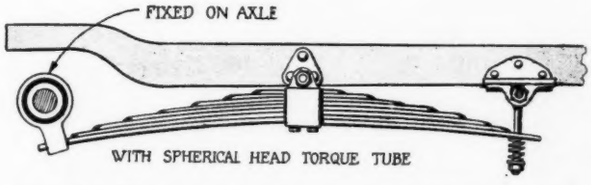


Fig 10. Sliding support at rear, anchorage at front with adjustable supplementary spring to absorb minor shocks.

erally is apparently quite as desirable as in the case of the Napier.

In regard to the remaining diagrams, they are almost self explanatory. The designs shown in Figs. 5 and 6 are, however, in their application, lacking in means for lubricating the plain siding bearings of the spring ends. This seems to be an unfortunate omission for, in connection with semi-elliptic springs similarly supported, the writer has encountered excessive wear of spring ends, necessitating the renewal of the main leaves in less than 10,000 miles' running—to say nothing of squeaks, rattles and hammerings. The latter can become pronounced under certain conditions of running, especially in cases where this type of sliding support consists merely of a platform or roller bearing for the spring end, without means of preventing the latter from "lifting." This omission occurs frequently, although the provision of rollers above and below, as in Fig. 7, presents no difficulty and an inappreciable addition to the cost.

The Lanchester cantilever spring anchorages are on the lines of those indicated in Fig. 7. As a refinement the rollers are enclosed in a "box" slung below the axle, and the extension of each main leaf is subjected to constant lateral pressure against one side of the box by a stiff helical spring, to prevent hammering due to side play.

Fig. 8 shows diagrammatically the unique ball-jointed shackles of the Lorraine-Dietrich spring. If one considers all the possible movements, relative and uniform, of axle and spring, one must admit that the universal movement allowed by the ball joints will occur under certain conditions. But provision to this end has apparently been considered unnecessary by any other manufacturer, although the Charron arrangement shown in Fig. 9 approximates the Lorraine-Dietrich so far as the rear ends of the springs are concerned. In this case, as the wording on the diagram conveys, the ring bracket is provided with a spherical bearing on the axle casing, the only instance of this arrangement the writer has encountered.

The demand for supplementary springs in connection with semi-elliptics is pronounced in England, their purpose being, of course, to absorb the smaller road shocks and to take up the initial portion of larger ones. The principle has been embodied in the final design illustrated in Fig. 10, but it would seem to be quite uncalled for, in fact, undesirable, in conjunction with cantilevers; even normally the latter demand a large scope for axle movement relative to the frame and are supple to excess in several instances within the writer's knowledge.

Monel Metal for Engine Valves

THE present-day aviation engine operates at much higher temperatures than were considered possible a few years ago. One of the greatest problems in the development of such engines has been the securing of a suitable material out of which to construct the valves. The life of ordinary valves is so short and their service so unsatisfactory that an improved material is urgently needed.

In a recent paper presented to the English Institution of Automobile Engineers, the merits of different steels for this service are discussed. No mention is made, however, of monel metal, a material which recent tests at the Bureau of Standards indicate to be deserving of serious consideration for this class of work. Exhaust valves of this material have given satisfactory performance in a 180-hp. Hispano-Suiza engine during 130 hr. of running time. Of this time the first 90 hr. were devoted to tests made primarily to study the behavior of the lubricating oils. The engine was operated for periods of about 6 hr. each, during which time it developed between 130 and 140 hp. at 1800 r.p.m.

Examination of these valves at the end of 45 hr. showed them to be badly pitted; they were ground just enough to reveal the condition of the valve seats and these, too, were found in the same condition, although no considerable drop in power had been noted. During the next 45 hr. the horsepower was substantially the same as during the first 45 hr., although a slight increase appeared during the first run following the replacement of the valves. The valves were then subjected to 40-hr. service under conditions far more severe than those encountered in normal operation. The engine was being used in connection with a study of preignition and for this purpose was operated at 1800 r.p.m. under full load for a period of from 4 to 20 min.

During the greater number of these runs preignition was intentionally produced, resulting in extremely high engine temperatures. An evidence of these high temperatures was furnished in one instance by the fusing of the nichrome electrode of a specially prepared spark plug, the electrode's melting point being 1500 deg. C. In fact, one of the evidences of preignition was that when the engine was shut down the exhaust valve in a cylinder that had been preigniting would remain red for nearly a minute after the valves in the other cylinders had become black. In spite of the severity of these tests, there was no evidence of power drop from leaky valves. At the end of 130 hr. of running time the condition of the valves and valve seats appeared to be no worse than at the end of the first 45 hr. It would, therefore, seem that the pitted appearance which is a characteristic of this material has little effect on the gas tightness of the valve.

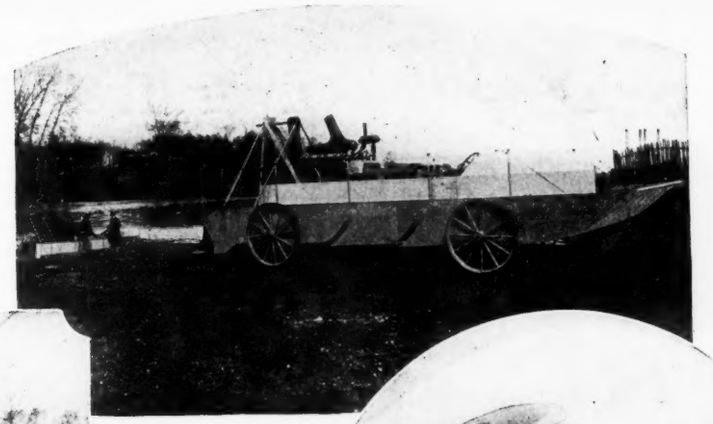
Quantities of Cotter Pins Used

IN the automotive industry, cotter pins are being used extensively and the market would appear to be widening. In the high priced cars, an average of 80 pins is a low limit and taking this as an average, an annual production of 2,300,000 cars would make a market for 184,000,000 pins. As the market is widely scattered, the method for distribution is one of the main points to be considered. Some form of container holding a limited number of assorted pins is convenient in supplying jobbers and repairmen.

Pins are frequently lost during the processes of repairs and the market opened up in this connection is not to be overlooked by any means, for the possibilities loom large. It is more economical to use a new pin than to search for an old one. That point particularly should be kept in mind when analyzing the market. The psychology of the lost cotter pin and the lost collar button are similar and the temptation to replace the pin is heightened by having a supply at hand. The market for replacements on the 7,523,664 cars and trucks registered on Jan. 1, 1920, is an extensive one and is remunerative to those who know how to reach it.

Some of the parts with which cotter pins are frequently used are the following: 1 pin with the drive shaft pinion nut, 2 pins with the starter spring shaft, 2 with the inner brake band guide, 4 with the outer brake band, 6 with the outer brake band support spring, 2 with the steering knuckle pin nut, 2 with the tie rod bolt, 2 with the foot brake rod yoke clevis pin, 1 with the hand brake band lever stud washer, 8 with the foot and hand brake rod clevis pin and 1 with the steering arm bolt.

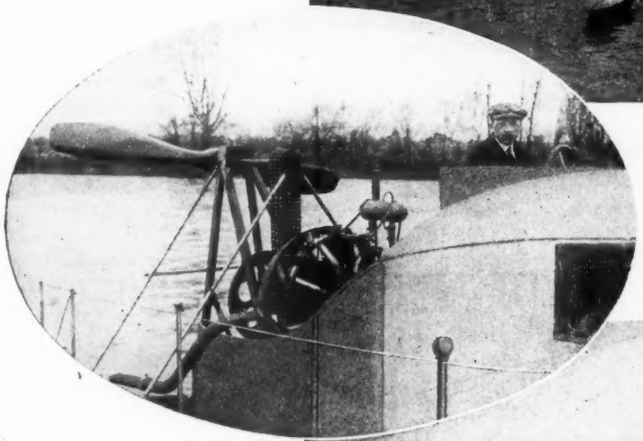
Air Propelled Motor Boats of French Construction



The De Lambert glider with Renault aviation engine and aerial propeller. Intended for passenger service on shallow waters, and will take part in the coming races at Monaco

The De Lambert glider, with Renault aviation engine and aerial propeller, traveling at speed on the Seine

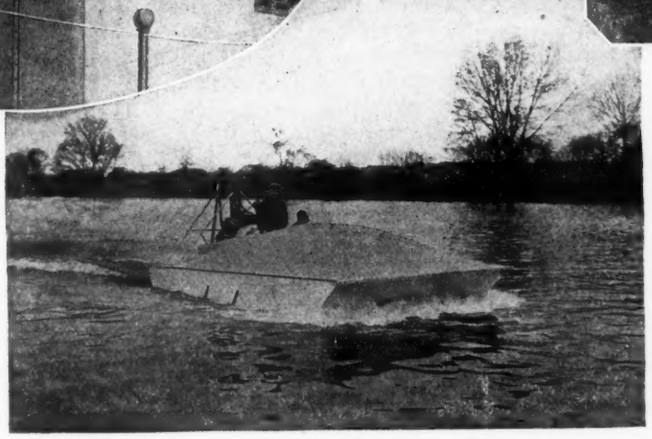
Count De Lambert, first European pupil of the Wright brothers, on his passenger-carrying glider, driven by a Renault aviation engine



Despujols boat with Sunbeam 450-hp. 12-cylinder airship engine which is claimed to have attained a speed of 74½ m.p.h. on the River Seine

Above — The De Lambert glider, which has been designed for passenger service on shallow waters, is driven by a Salmson star-type aviation engine. The boat will take part in the Monaco cruise and races

Salmson star-type aviation engine used on De Lambert glider



Right—The De Lambert glider, with Salmson star-type aviation engine and aerial propeller, running at speed on the Seine. The boat has attained a speed of 52 m.p.h.

The Design of a Laboratory for Carburetion Investigation

Many automotive plants in the United States are being equipped with research facilities such as are described in this article. Convenience of operation and the obtaining of accurate observations with the minimum duration of engine run are, of course, factors to be sought.

THE dynamometer laboratory at the plant of the Stewart-Warner Speedometer Corp. has been designed to afford the greatest possible conveniences in operation and to permit accurate observations with a minimum duration of run. These qualities are highly desirable in any laboratory, but they become of paramount importance in the conduct of such work as the investigation of the carburetion requirements of engines, for instance, where great numbers of runs must be made, each involving a large group of observations, before a complete picture can be plotted.

While one of the chief uses of the laboratory is the development of fittings of the Stewart heavy fuel system to engines, for manufacturers of engines and automotive apparatus, an unusual amount of research in carburetion has been carried out. This work is under the direction of P. S. Tice, designer of the Stewart heavy fuel system and lately in charge of the carburetion investigations that constituted a part of the war activities of the Bureau of Standards.

A Sprague cradle dynamometer generator of 75 hp. rating is employed, in conjunction with a standard Sprague control panel. The base for this unit, together with that for the engine, is set in concrete some few feet off center in a room, 17.5 x 35 ft. The exciter and its controls are mounted at the side of the generator. This arrangement minimizes lengths of leads and makes a compact grouping, with plenty of elbow room all around. The control panel, with the resistance grids a few feet away and directly behind, is located and connected by leads in overhead conduit, so that it is under the operator's hand and eye, without obstructing the passage around the central group.

The Cooling Water System

Slightly forward of the engine and on the wall close to the ceiling is mounted a 40-gal. water tank. It is provided with 1½-in. pipes to and from the engine, with a valve-controlled filling line and with a 1-in. overflow leading to a soil-pipe. The cover is soldered all around, the only vent being through the overflow. This arrangement keeps water vapor from the tank out of the room.

In the pipe from the bottom of the tank to the engine is located a gate valve. Also, at the level of the floor and under a removable board of the wooden operating platform is a pipe with a large cock valve connecting the engine supply pipe with the overflow line. Opening the cock just mentioned permits of draining the entire system or of draining the engine only, depending upon whether the gate valve is open or closed.

The filling line to the tank is provided with a branch running down along the wall, parallel with the engine supply and the overflow, to a thermostatic regulator operated by vapor pressure changes in a bulb enclosed in a tee in the line returning water to the tank from the engine. Altering the weight hanging from the outer end of the thermostat lever alters the temperature of the jacket water and the action of the regulator maintains the set temperature. The arrangement of the water piping, like that of the electric lead conduits, leaves the side spaces unobstructed. Suspended from the ceiling is a 5-in. exhaust pipe with a dependent leg at the rear of the engine, to which connection is made through a large tee, with gate valve cut-out and flexible metal tubing.

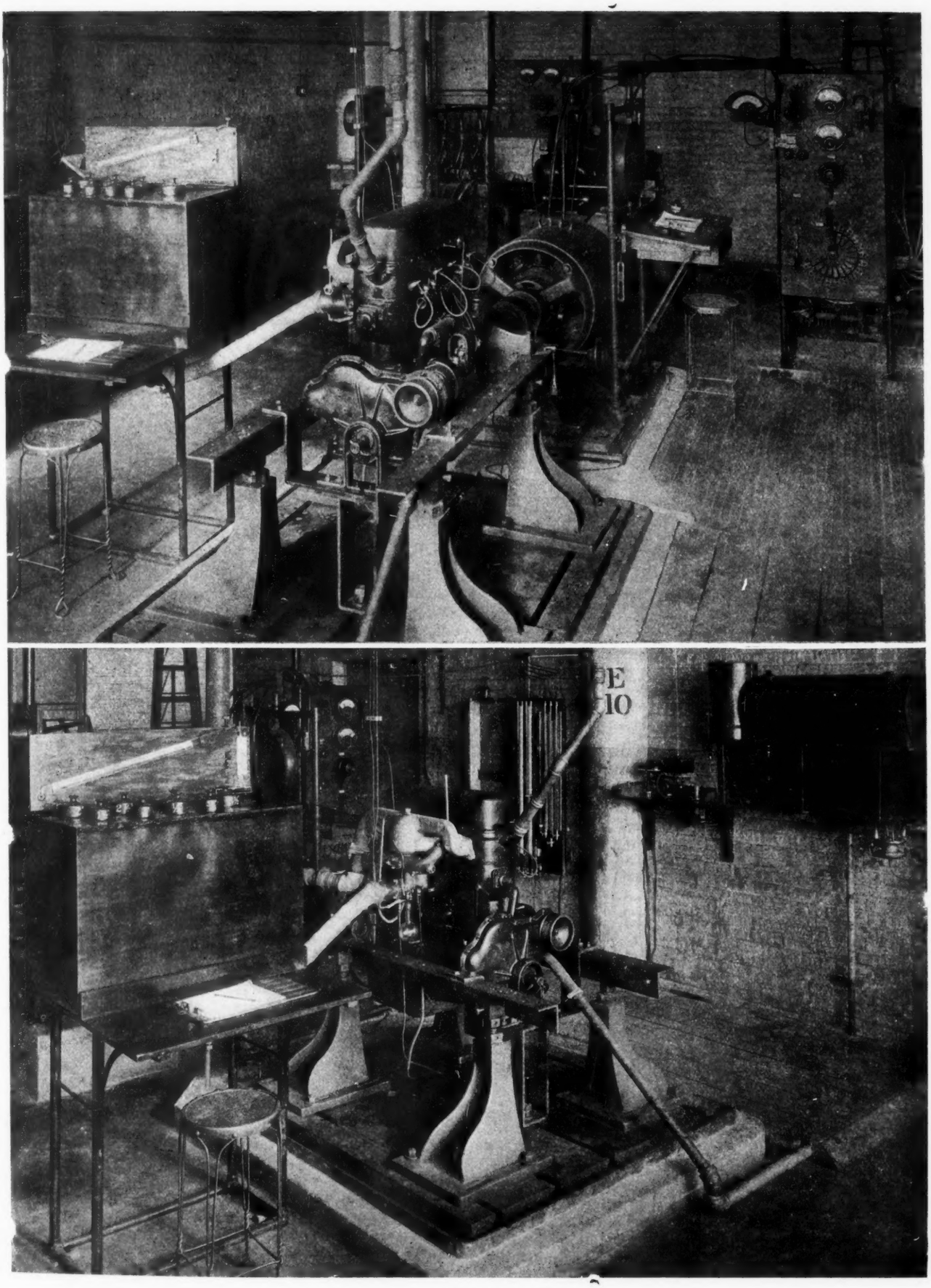
Bracketed upon the wall just above the thermostatic water regulator is a double shelving, upon the upper deck of which are mounted two fuel tanks. Each tank is provided with a needle valve discharging into a common outlet, so that the contents of one or the other may be fed to the engine at will. The smaller tank ordinarily contains gasoline and the larger a heavier fuel.

Starting the Run

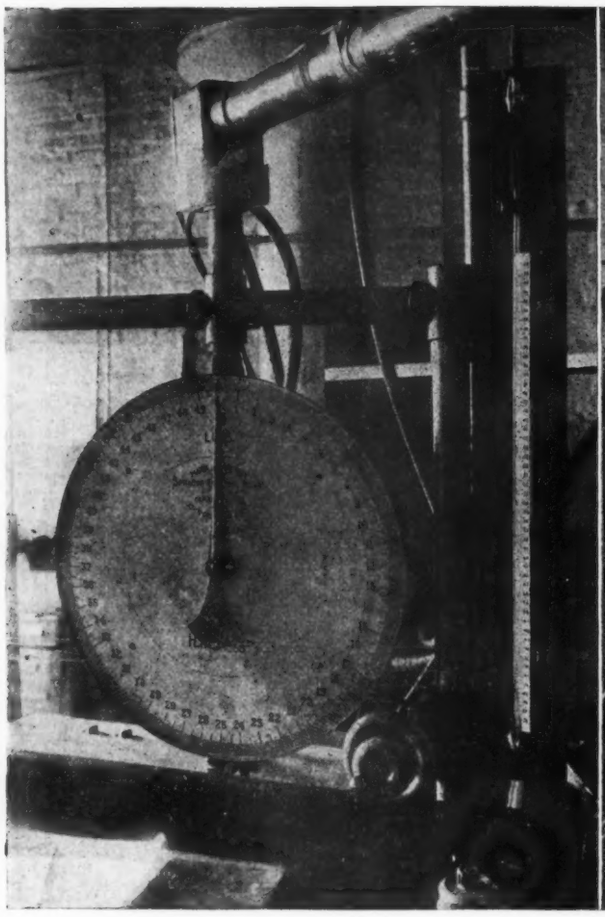
The common discharge pipe from the tanks passes through the lower shelf and connects with one end of the through passage of a three-way cock. The other end of this passage connects to the carbureter, by way of a line passing under the operating platform. The cross leg of the three-way cock is provided with a tube extending up through the shelf supporting the weighing scale and connects with the weighing tank by a rubber tube. The latter tank has a capacity of approximately 3 lb. of fuel and is provided with a combination vent, standpipe and tank gage of ¼-in. glass tubing, extending well above the tops of the supply tanks. The other pan of the trip balance carries a tare weight of such value that the tank pan swings down when the tank is filled with fuel.

Secured to the weighing shelf, with the scale, is a pair of mercury cups, into which dips a forked contact piece when the beam comes into equilibrium. This action completes a battery circuit through the windings of the stop-watch actuator (shown at the right of the balance), the revolution counter solenoid (shown on the dynamometer control panel), and an annunciator mounted under the weighing shelf.

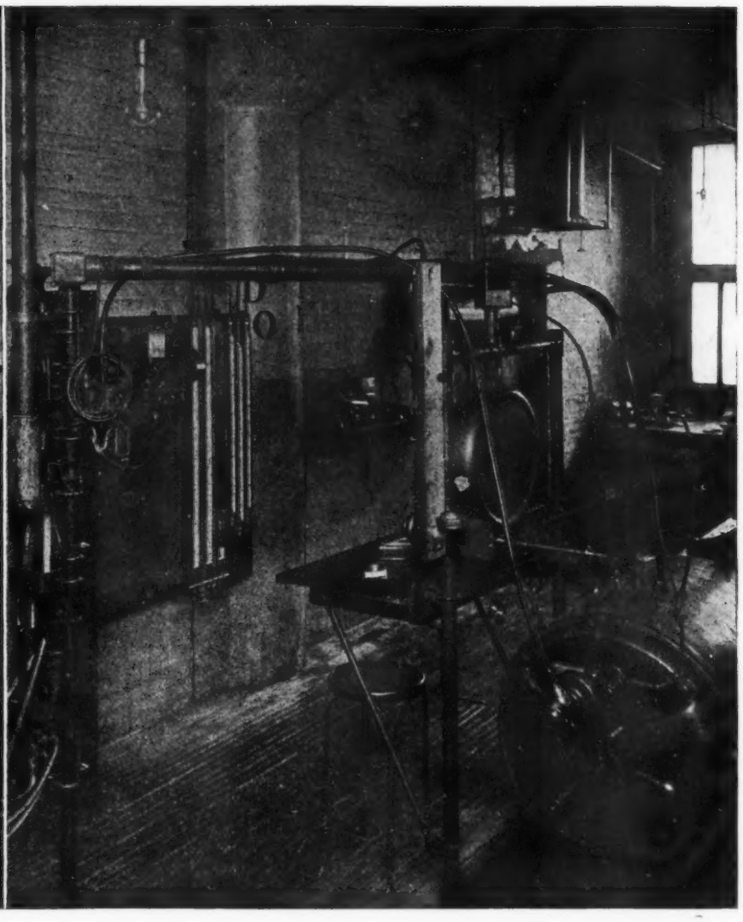
Having set the conditions of a run, which setting is made with all three legs of the three-way fuel cock open, the run is started by turning the fuel cock to communicate only the weighing tank with the carbureter. As fuel is taken by the engine the balance comes into equilibrium, closing the circuit through the watch and counter controls and the annunciator, starting the first two. A weight is then set upon the top of the weighing tank, returning it to its former position and breaking the circuit. When the engine has consumed an amount of fuel



Two general views of the Stewart-Warner test plant



-Spring scale of Sprague dynamometer



Grouping of apparatus for convenience in making observations

equal to the weight placed on the tank, the balance again swings, closing the circuit, stopping both watch and counter and sounding the annunciator. Shifting the cock back to the all open position breaks the circuit by refilling the tank. After recording the time and revolutions the watch and counter are reset—the former by an electric push button in the watch mounting and the latter by a reset knob. Removal of the run weight from the weighing tank leaves this portion of the apparatus set for the next run.

The counter drive and controls are simple. A speedometer drive shaft with a swivel joint mounted on the chain guard at the rear of the generator drives a 10 to 1 worm and wheel. The counter spindle is provided with a spindled collar constituting one member of a positive clutch, a pin in the face of the collar engaging with a star wheel on the worm spindle. The collar is shifted by a fork secured to a sliding rod, the latter being linked by a connecting rod to an eccentric. The solenoid plunger has a rack secured to it, meshing with a small pinion engaging a ratchet wheel on the eccentric spindle through a pawl. A full stroke of the plunger turns the pinion and eccentric through a half revolution, thereby engaging the counter on one stroke and disengaging it on the next.

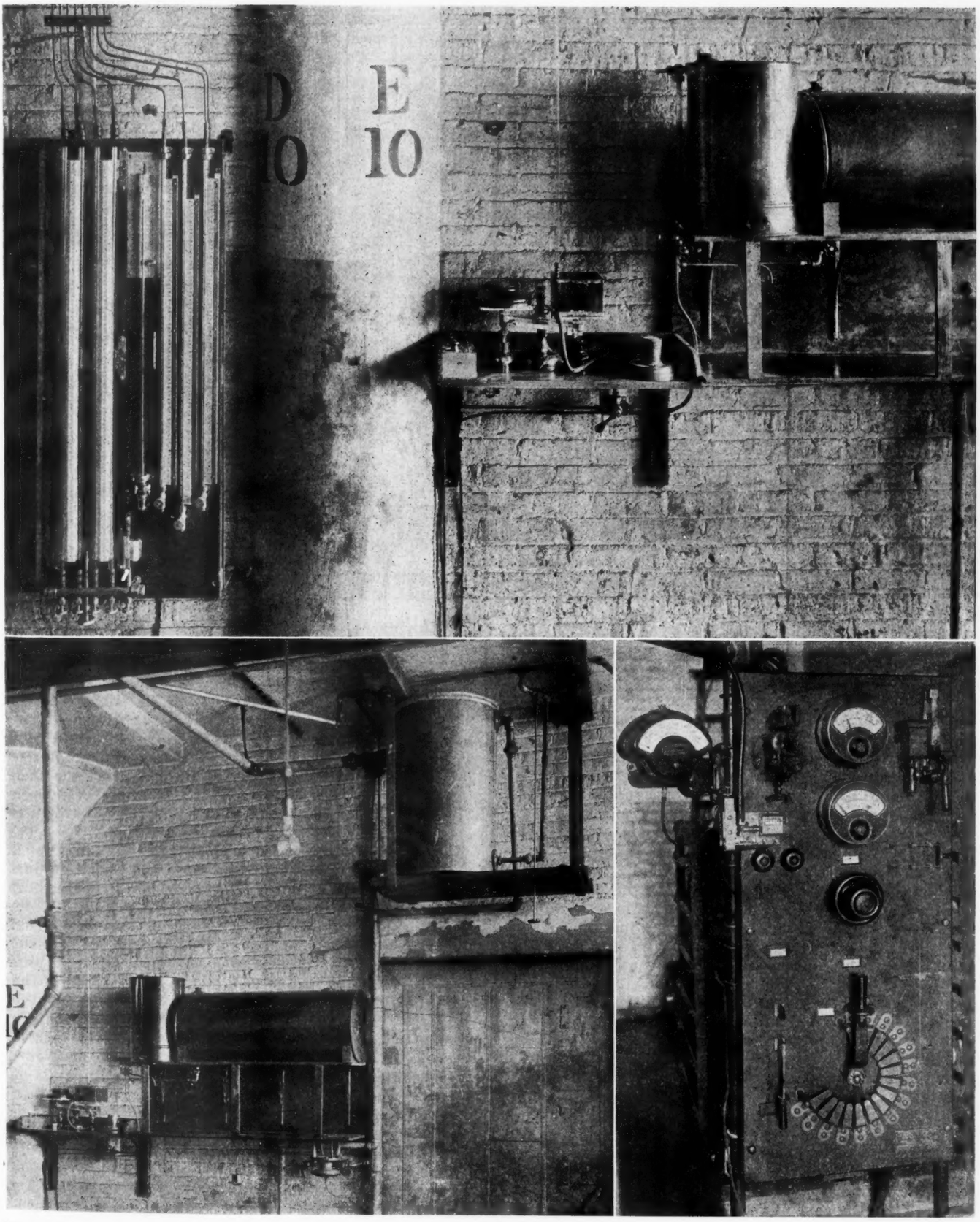
The apparatus employed in measuring the air flow consists of a large box made of wood and sheathed in galvanized iron, with all joints securely soldered to prevent air leakage. The top wall of the box has secured to it, by screws and soldering, a set of eight circular plates, each having an orifice formed in it. Closure of the orifices not in use is effected by large iron weights, formed with loose fitting pilots and provided with pure gum rubber gaskets having 1/16-in. square section. The pressure on the gasket is sufficient to compress them considerably. This, together with the fact that they are kept moistened with glycerine, insures air-tightness.

A 3-in. pipe elbow, with a well-packed union to permit of swiveling, provides an air outlet at the bottom of the box. A tire tube, securely ligatured at the ends and fitted inside with a coil of spring wire, serves as an air conduit to the carbureter.

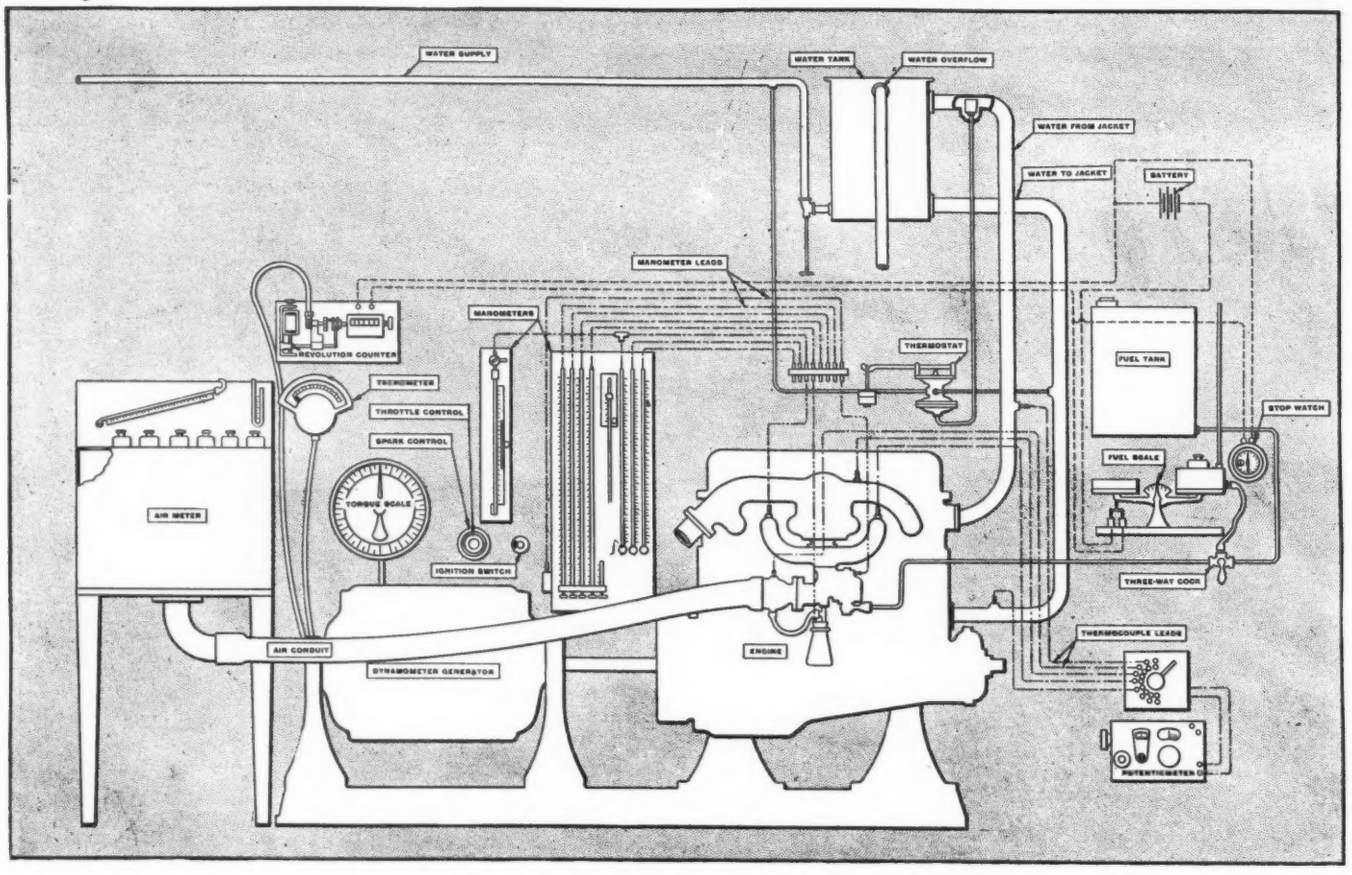
The pressure drop across the orifice is read on the inclined water column mounted above the box on a board fitted with a level and an adjustment for level. A total vertical deflection of 5 in. is provided in this manometer, the scale of which is 50 cm. long. Thus, a millimeter on the scale is equal to one one-hundredth inch of vertical water column. In setting up the manometer the angle of the tube was adjusted, with the level reading level, so that no correction need be made in the reading. The lower end of the tube connects with a small tank on the back of the board.

To use the meter it is only necessary to check the leveling of the board and have the zero of the scale at the zero water level with no air flowing, then using such an orifice that the water column stays on the scale. To change the orifices one merely removes the weight from the next smaller or the next larger, as required, and covers the one that has become unsuited.

In size the orifices range from 3.500 in. to 0.500 in. by 0.500 in. decrements, with an additional one of 0.3125 in. They follow the specifications laid down by Durley in his classic researches on air flow through sharp-edged



Above—Manometer board, fuel weighing scale shelf, stop wa tch actuator, fuel tanks, etc. Below; left—Water tank under ceiling, fuel tank on wall, thermostatic water regulator, fuel weighing scale, stop watch actuator, etc.. Right—Switchboard



Diagrammatic layout of plant

orifices in thin plates, both as to the plates themselves and as to their surroundings.

All temperature readings are made with a Leeds & Northrup automatically compensated potentiometer having the scales calibrated to read degrees Fahrenheit direct. For temperatures below 400 deg. Fahr. copper-constantin couples are used, and for the range 400-2000 deg. (exhaust temperatures) iron-constantin couples are employed. All the couples lead to a rotary selector switch connected with the indicating instrument, making it possible to record observations with great rapidity.

Combined with the driving mechanism of the optical indicator is a phase-changing drive for the stroboscope employed in making observations of the interior of the intake manifold, and also a spark timing indicator. The latter consists of a stationary (but adjustable) ring graduated in single degrees. Revolving within the ring is a pointer driven at crank speed. The gap between the pointer end and the inner graduated periphery of the ring is sufficient to make the spark clearly visible. Both pointer and ring are insulated and their gap is placed in series with one of the spark plugs.

For the measurement of pressures at various points in the intake system a group of manometer columns is provided. These comprise four water columns capable of 1000 mm. variation and three mercury columns capable of 750 mm. variation, mounted together with a barometer on a supporting panel. All these manometer columns are of the single leg variety, with wells at the back of the panel. In the case of the mercury columns the wells have 200 times the cross sectional area of the tubes, thus giving direct readings one-half of one per cent too small. Each is provided with a needle valve for the purpose of damping out oscillations of the columns.

The water columns all connect to a common header or manifold which is in free communication with a tank on the back of the panel. This tank runs clear across the panel and has an area equal to 400 times that of one of the tubes. To make possible exact direct readings, the tank is provided with a gage glass and both double scales are mounted together on sliding plates so that they may be adjusted by a screw to keep the scale zero at the level in the tank. Each water column is fitted with an independent needle valve. The barometer is a simple type with adjustable cistern.

Each column is provided with a lead of ¼-in. copper tubing running to the ceiling, across to a position just above the engine and down to a plate support. Here the required connections are completed with lengths of tubing and rubber nipples with ligatures. An extra lead runs from the plate above the engine to the back of the manometer panel, for the purpose of applying a plus pressure, if desired, to the well of one or the other of the mercury columns, or for connection to a well for the purpose of reading directly the difference in pressure between two points, neither of which is at atmospheric pressure. It should be noted that by the use of T's or Y's the columns can be connected at the engine ends of their lines in any combination desired. For instance, a water column and a mercury column may be connected together and readings made on the former up to the limit of the capacity of the column, when its needle valve is closed and observations are continued on the mercury column.

In much of the work that has been done in this laboratory it is necessary to set the intake manifold pressure at definite absolute values. To accomplish this and to have the reading directly under the eye of the operator—as much so as the tachometer—an additional mercury manometer is mounted on the torque scale supporting

frame. This column also has a well, duplicating the others noted, and connects permanently through a tee with a column on the panel used to indicate manifold pressure drop. In the case of this controlling manometer the scale is inverted and is fitted with a rack and pinion so that it can be readily adjusted.

At the start of a group of runs the barometer is read and recorded and the scale of the control manometer adjusted so that the barometer reading is at the zero level of the mercury. The reading of the control manometer is then the absolute value of the manifold pressure. Should the barometer reading change during a set of runs the control column can be let down by manipulation of its glass three-way cock and its scale reset to the true value.

All of the manometer scales are beveled, so that the graduations lie in part back of the tubes. This greatly facilitates reading, particularly in the cases of the water columns.

Standing facing the torque scale, the operator has before him the control manometer as discussed, the ignition switch, and the throttle and spark controls. On his right, within direct line of sight, are the tachometer and revolution counter, and at his hand the speed control. In arriving at a setting the throttle is conveniently manipulated by one hand while the other adjusts the speed.

Flexible braided wire belts are used for the remote spark and throttle controls. These controls are extremely flexible in installation, are easy running and are free from backlash. Pulleys may be used to take the wire around corners, but a short length of bent tube, well supported, is equally satisfactory. Any ratio desired between the controlling spindles is easily secured by varying the pulley diameters. The control is made positive in both directions by notching a side wall of each pulley groove in two places close together and running the wire out of and back into the groove. Turnbuckles keep the wires taut.

In the special case where the throttle must be set with extreme delicacy, as in adjusting to a setting of a definite manifold pressure at a definite engine speed, simple sharp V-grooved pulleys are used in the throttle control, the controlled pulley being mounted on the spindle of a worm meshing with a worm wheel secured to the throttle spindle. In the set-up employed in this work the throttle controlling spindle is required to make 12.5 revolutions between the fully closed and fully open positions of the throttle. So delicate is this control that one can alter the torque by definite increments of 0.05 lb. as desired.

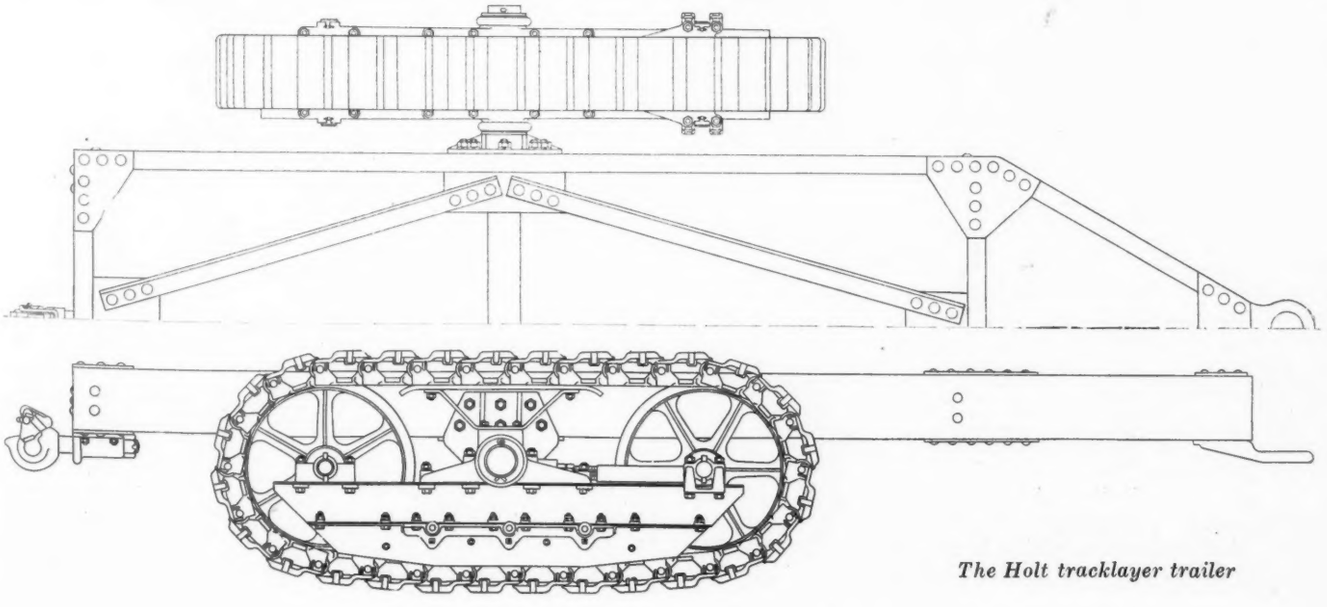
Centralization of the controls, grouping of units and the semi-automatic nature of a number of the observations make it possible for two men to handle comfortably the most involved set of observations that it is required to make. At the same time it is not unusual for two men to complete a group of 80 to 100 such runs in the course of a day's work.

A Tracklayer Trailer

DURING the war the tracklayer tractor industry received a great impetus, owing to the extensive use of this type of tractor for hauling heavy artillery and for other purposes. Since the armistice much use has been found for this form of tractor in industrial fields, especially in the oil fields and in logging. It has been found necessary, however, to develop trailers that can cope with the same ground conditions as the tractor itself. With the tracklayer type of tractor the ground pressure per unit of area is exceedingly low, and the tractor can be successfully used in very soft or muddy places where a loaded wheeled trailer will sink in to the hubs.

Owing to the boggy nature of the country, logging has been confined so far to the winter months, when the ground is frozen and covered with snow and ice. With tracklayer type tractors and trailers it is expected in the future to carry on the work all the year round.

We show herewith some drawings of a creeper trailer built by the Holt Mfg. Co. It consists of a frame supported by two bolsters on a stationary axle and of two track chains with their corresponding frames and guide wheels. The trailer has a capacity of 5 tons and weighs 3100 lb. The frame is built up of 8 in. steel channels and angle steel braces, and the axle measures 4 in. in diameter.



The Holt tracklayer trailer

The Utilization of Aluminum for Engine Cylinders

In view of the recent experiments and predictions in regard to air-cooled power plants, this article by Doctor Rosenhain, of the National Physical Laboratory, Teddington, England, becomes of unusual interest. The author will be remembered because of previous articles in this publication. It may be added, however, that he is an eminent student of metals.

By Dr. Walter Rosenhain, F. R. S.

THE use of the aluminum alloy piston in airplane engines has brought with it such important gains in regard to engine efficiency that it would seem a natural development to carry the same principle further. In that direction it is obvious that, if the thermal conductivity of the material constituting the cylinder walls of an internal-combustion engine could be considerably increased, a further raising of the compression ratio should be possible, or alternatively, larger cylinders could be used without lessening the efficiency of cooling.

It would, of course, be anticipated that this consideration would apply more forcibly to air-cooled than to water-cooled engines but the endeavor has been made to apply the principle to both types of aircraft engines and to some automobile engines also. It cannot, however, be said that the results have corresponded to anticipations for the increase in engine efficiency resulting from the application of aluminum alloys to cylinder construction has not been nearly so great as that which resulted from the introduction of the aluminum alloy piston. It would seem, therefore, that the problem of rightly utilizing aluminum alloys for cylinder purposes is not yet fully solved and, perhaps, it will be worth while to consider some of the factors on which any solution must depend.

There can be little doubt that the crux of the whole matter lies in the use of liners in aluminum cylinders. Although in experimental engines aluminum pistons have run successfully for a time on bare aluminum surfaces, no one has regarded such a construction as even reasonably reliable for practical purposes. The interior surface of aluminum alloy cylinders has, therefore, always been provided with a hard-wearing surface of iron or steel, generally in the form of a cylindrical liner placed within the aluminum alloy casting.

Many disadvantages, however, accrue with the use of such liners. There is, in the first place, the problem of construction. It is not possible, except with small cylinders, to cast the alloy around the liner, since the subsequent considerable thermal contraction of the aluminum, which is much greater than that of steel, either leads to the cracking of the casting during cooling or, at best, leaves it severely strained and liable to sudden failure in service. One of the methods which have been employed for inserting the liner into the finished casting consists in simply providing the outside of the liner and the inside of the aluminum jacket with a screw-thread of moderate fineness and then screwing the cold liner into the cold alloy jacket. An alternative, which is probably preferable, has been adopted in the well-known "B.R.-1" type of aircraft engine, in which the aluminum alloy jacket is shrunk on the steel liner.

Of these two methods, the latter has a decided advantage, owing to the fact that, as the cylinder becomes heated in use, the aluminum casing expands to a much greater extent than the steel liner. If they have been a screwing fit when cold, quite a small rise of temperature will cause a slight gap between them. If the aluminum has been shrunk on, however, the first effect of internal heating will merely be to lessen the tension of the outer casing and only after a considerable rise of temperature will the casing expand out of contact with the liner. There can be no doubt, however, that there is a very definite absence of thermal continuity between the liner and the aluminum alloy casting and this will become increasingly evident the higher the temperature of the alloy jacket. When an engine is running, an equilibrium condition will be reached in which the liner is much hotter than the jacket—so much hotter, in fact, as to balance more or less completely the greater thermal expansion of the aluminum alloy and thereby to keep the liner pressed reasonably tight against the jacket. That this will occur is evident because, as soon as the liner cools a little below that temperature, the loss of thermal conductivity at the junction of steel and aluminum will rapidly increase and then the temperature of the liner will rise until contact is again attained.

From the point of view of engine efficiency, however, the temperature of the outer aluminum alloy jacket is of no importance; what matters is the temperature of the liner and it is doubtful whether this is much lower than that of the inner portion of an all-steel cylinder. It has been clearly shown, for instance, that such a device as coating the outside of a thin steel cylinder with electro-deposited copper, in the hope of obtaining increased cooling effect from this highly conducting outer layer, is ineffective in producing any material decrease in the temperature of the inner cylinder walls. In the case of the aluminum alloy jacket with a steel liner, however, one important advantage does remain, that is a considerable improvement in the uniformity of temperature distribution around the cylinders. In air-cooled cylinders, particularly in aircraft engines, the windward side receives much greater cooling from the air than the leeward side and in the case of iron cylinders, this causes differences of temperature leading to serious departure from a true circular section. The steel-lined aluminum alloy cylinder, however, thanks to the high thermal conductivity of the jacket, avoids this trouble almost entirely.

If we recognize the relative inefficiency of the aluminum

cylinder construction in which a steel liner is employed, it becomes desirable to consider possible alternatives. By far the best would undoubtedly be the development of an aluminum alloy—or of some other alloy combining the high thermal conductivity of aluminum with sufficient resistance to wear to allow of its use without the provision of any additional hard-wearing surface. As yet, it must be admitted that no such alloy has been found, and it is at least doubtful whether any aluminum alloy is likely to be found which could successfully withstand the combination of high pressures and high temperatures, together with the risk of occasional partial deficiency of lubrication to which the interior face of a cylinder is exposed. This is a matter which metallurgists will no doubt bear in mind in their future investigations of light alloys, but for the present, at all events, no such material is obtainable.

Aluminum Cylinder Heads

A second alternative, and one which is being widely adopted, is to admit the difficulty and our failure to surmount it, and to concentrate upon the use of aluminum alloys for the combustion heads of cylinders, which are not exposed to contact with the piston and in which, therefore, no liner or inner protecting surface is needed. For this purpose, aluminum alloys are now used to a considerable extent and the difficulty, originally anticipated, with regard to the attachment of steel valve-seats, appears to have been safely overcome in much the same way as the corresponding difficulty in regard to the piston pin bushes in pistons. But limitation to cylinder heads involves the abandonment of a great part of the possible value of aluminum cylinders in air-cooled engines, because not only is the cylinder head only a fraction of the total cylinder area, but the cylinder also loses the very considerable advantage in cooling effect which is gained with an all-aluminum cylinder by conduction to the crankcase, etc.

It would seem worth while, therefore, to consider any other possible modes of construction which offer prospects of avoiding the disadvantages of the steel liner. One possibility which suggests itself is the use of liners made of alloys having both a higher coefficient of thermal expansion and also a greater thermal conductivity than steel. The use of certain bronzes, and particularly of one of the alloys generally termed "aluminum bronzes" suggests itself. In regard to their thermal properties, some of these constitute a much nearer approach to the aluminum alloys than does steel.

Another possibility would appear to consist in providing the aluminum alloy cylinder casting with a hardened inner surface not necessarily of a continuous character. If the casting cracks owing to contraction when cast around a steel liner, this could be avoided by using a liner which has previously been split longitudinally in such a way as to allow it to be sprung inward by the contracting aluminum. This process might even be carried to the point where the "liner" consists of a series of steel strips embedded in the interior face of the cylinder casting. There is, however, the obvious difficulty that in such a construction there would be a tendency for the formation of minute erosion channels in the aluminum surfaces between the steel strips and these would lead to the serious escape of gas, loss of compression, etc. If the steel strips were further broken up, into a large number of irregularly shaped and closely packed fragments of steel so placed in the mold as to become embedded in the inner face of the cylinder casting, it is possible that the development of erosion and leakage channels might be checked, but although possible, this procedure offers considerable difficulties from the foundry point of view.

Another possible method of providing the interior wearing surface of an aluminum alloy cylinder with a hard coating may be found in the electro-plating process. This process has recently found some startlingly useful applications of a character which had not previously been contemplated, particularly in connection with this very matter of wearing surfaces. For instance, worn steel shafts have been saved for further service by depositing upon the worn surfaces layers of electro-iron which have been found to possess sufficient strength and adhesion to afford a serviceable life for the repaired article. The use of electro-deposits made on aluminum alloy castings for repair purposes has also proved successful under war conditions.

The production of a hard internal coating on a cylinder casting by means of electro-deposition has actually been tried, and promise of highly successful results has been obtained. It is true that it is not the easiest of operations to secure a good electro-deposit on an aluminum alloy surface, even when copper is the metal deposited, but with care and skill it can be done quite satisfactorily. It is not easy to do this with pure aluminum, but the alloys ordinarily used for engine castings of this kind contain enough copper to facilitate the adhesion of electro-deposited metal. The question then arises what metal should be used to form the wearing surface of the cylinder. In order to obtain adequate hardness, it is probably desirable that either iron or nickel, or possibly an alloy of both, should be used. Owing to the considerable difference in thermal expansion between iron and an aluminum alloy, however, it is inadvisable to attempt to deposit the iron directly on the aluminum casting. By first covering the aluminum with a thin layer of electro-deposited copper, several advantages are gained. The copper has an intermediate rate of thermal expansion as compared with iron on the one side and aluminum alloy on the other, and its presence, therefore, will lessen the strains set up on heating; at the same time, the coating of the aluminum with copper will considerably facilitate the deposition of iron or nickel.

Terminated Further Advance

Following this procedure, eminently successful coatings, both of nickel and of iron, have been applied to aluminum cylinder castings, and these coatings have subsequently undergone the machining operations quite successfully. The whole development, however, took place at so late a stage that the termination of hostilities has arrested further advance, and results of any actual running trials are not available. The relatively very thin electro-deposited coating, however—provided that it proves strong enough to withstand the usage to which it is subjected in the engine—has certain very definite advantages over any separately introduced liner. One of these advantages is that it is much thinner than any liner can possibly be made, and, therefore, offers much less resistance to the passage of heat and sets up much smaller stresses as the result of thermal expansion. Another important point is that the electro-deposited metal, if it is made to adhere to the aluminum base sufficiently firmly to resist machining, etc., possesses a far better thermal and mechanical contact with aluminum than is the case with a mechanically introduced separate liner. This is probably the most important point of all, since it is the slight mechanical discontinuity at junction of liner and casting that really impairs the thermal efficiency of the whole cylinder.

What has been said above in regard to the problem of the aluminum alloy cylinder has direct reference mainly to air-cooled cylinders. It is, however, directly applicable to all those forms of water-cooled cylinders which are cast in such a manner that each barrel is formed by a complete aluminum cylinder into which a liner—in the more usual practice—is inserted.

The Use and Value of Wood in Building Bodies

Lumber and woods are becoming increasingly difficult to obtain, particularly certain timbers that have been used in large quantities. This article endeavors to show that the body builder has a wide range of woods and that rigid restrictions are not essential in keeping the quality high.

By George J. Mercer

THE use of wood for automobile body construction is confined to-day, except for a negligible number of custom built bodies, to what is designated as the body framing. The transition from bodies constructed entirely of wood, like the carriage, to what is called the composite body, composed of wood framing and metal panels, began at the earliest period of motor car use. Wood panels could not stand the punishment due to the increased speed, long continued use with its attendant abuses, the turning of corners at a high rate of speed and the tearing action of the top on touring bodies when up, due to the swinging action accentuated by wind pressure.

It might be asked why wood is used at all in body construction since it is conceded that metal is so much superior for the casing or outer shell. Ultimately metal will supersede wood for many of the framing pieces. Open bodies are being made in large numbers in which the use of wood is confined to floorboards and the sticks to which the trimming is nailed. The idea of making an all metal body is such an alluring proposition that from the very beginning of the industry there have been optimistic manufacturers who have attempted to market bodies so constructed. But considering passenger car bodies only, the attempt has not been financially successful until quite recently at least. The writer has in mind one manufacturer who was a pioneer in attempting to build the composite body.

The urge for an all metal body is augmented by the scarcity of available wood. The only possible substitute is metal. The composite pressed wood substitutes are suitable for roofs and panels but they have no value as framing. Not all woods are suitable; only good live hard stock may be used, and some of the pieces must be clear grain and free of knots and blemishes so as to have the requisite strength.

Substitution of Cheaper Wood

To substitute metal for parts of the framing is prohibitive for all but a few of the car manufacturers, on account of the high cost of dies. Then, too, most car manufacturers are affected by changes in body styles. Therefore, the manufacturer whose output is the result of an expensive tool equipment lacks the flexibility of the one who can make minor changes with less expense. Unquestionably, the line of least resistance is still the composite body and the substitution of cheaper wood for this purpose is the only available means of augmenting the supply.

The seriousness of the timber supply has brought about more intelligent and economical methods of utilizing the timber on hand as well as making it possible to use wood heretofore not considered practical, such as red gum. Body manufacturers have their own kilns, they test all planks for moisture content and dry scientifically instead of following the haphazard methods formerly practised, thereby knowing exactly how the wood is going to act when machined. It is well understood that timber is variable and that its strength is not uniform in pieces belonging to the same species; therefore, intelligent care in handling in the kiln results in a big saving, as the use of selected stock is almost out of the question except for a few of the most important parts of the framing.

The Moisture in Wood

Every one knows that when cut, logs contain a large amount of moisture, sometimes more than the actual weight of the wood itself. From wood intended for body work all but about 8 per cent of this moisture must be removed; the wood is never wholly deprived of its moisture, as experience shows that it then becomes brittle and worthless. The wood gains in strength from 10 to 25 per cent with the moisture removed and machining operations are possible only with dry lumber, because the newly cut exposed parts of unseasoned lumber are dried out by the atmosphere and this causes them to twist.

To illustrate this, let us consider what is termed case hardened lumber. This term has the same meaning as when applied to steel but it does not have the same beneficial results. Lumber, when sawed into planks and stacked in the open, where the air circulates about it, eventually will become dry. If the planks are two or more inches in thickness, the time required to season properly would not be considered practical today. Therefore, it is put in the dry kiln and the process of years is accomplished in days. The planks, however, between the time they were rough-sawed and put in the kiln may have rested for quite a time in the air and the drying processes by nature may have progressed all over the outer surface with the result that the outer cells or fibers have become closer knit together, forming a casing around the inner part that remains nearly as full of moisture as when first cut.

This casing prevents the inner moisture from finding its way out easily. If the plank is put immediately into a dry hot kiln, the condition becomes aggravated. The outer casing is dry around the moist core and the plank when taken out after the customary heat seasoning, has a dual composition. When cut for machining, the newly exposed inner parts will dry by contact with the air and, as the outer part is already dry, the result is that the machined piece will change its shape and set quite different from the pattern by which it has been cut. Wood such as this is worthless; it will continue to change its shape as long as there

are unduly moist parts that will dry when exposed to the air. Losses of this kind are avoided by proper tests before the kiln operation and by giving the plank a bath of water or steam preliminary to the heat treatment, thereby restoring it to its primary condition where all the cells were uniform, the outer ones open to permit the inner moisture to escape.

Another method of conserving the wood supply consists of the use of machines that tongue, groove and glue together narrow pieces that formerly went to the refuse pile, into wide planks. It is customary to make planks from pieces not over 1 in. wide. Planks made in this way are suitable for the sills, where the best selected stock is none too good. Experience shows that sills made from built-up planks are reliable in service and are less subject to change of shape through moisture. The different pieces glued together act as a check on one another.

Laminated wood cannot be considered as a wood saver, as the more expensive wood serves as the veneer and cheaper wood as the core. Laminated wood, however, cannot be trusted where it is likely to be exposed to moisture, unless made with the newer process of using casein waterproof glue. The price keeps this out of use for the places where such wood is adapted, namely, seat boards and linings. It is useful, however, for instrument boards and finish.

Last but not least, as a saving agent for the wood supply, is good designing. Layout work well done takes into consideration all the angles of making the thickness of the plank count. This is accomplished by laying out each piece with reference to the plank size minus the loss in machine operation. Such work costs in time but, if the number of bodies to be manufactured is large enough to warrant the expense, it is one of the chief factors in material saving.

Woods for Body Framing

The woods used for body framing are ash, oak, maple, elm, beech, birch, gum, sycamore and chestnut. Whitewood, pine, spruce and basswood are used for seat boards and sometimes for floorboards.

Ash has always been considered the finest wood for body framing. Selected virgin growth, or forest growth, is termed body ash. It is slightly darker or redder than the second growth and generally called white ash. The latter is tougher and stronger and has large annular rings on account of its more rapid maturity. The trees receive more sun as they are not so thickly clustered together and are the result of the growth that matures after the forest has been cut down. Both forest growth and second growth were considered the ideal body timber as long as they were readily available, and some builders still prefer to pay the price and have white ash sills, using cheaper woods for the other parts.

Oak was never much of a factor in body work, except for trucks. Its ability to resist the decaying influence of water has always made it valuable for the latter service, and for the same reason it is ideal for floorboards. Inferior grades not suitable for furniture making are bought up by body builders for this use. The kind used is either the black or the red, principally the latter.

White oak has always been reserved for wagon poles, etc., where strength is required.

Maple is receiving more attention to-day than any other wood for body work. When of good quality it is suitable for use in all parts of the frame, including the sills. The varieties are hard, black, red and silver. The hard and black are the best woods. The drawback of maple is its excessive weight. A touring body made from maple will weigh 50 to 80 lb. more than one made from elm.

Elm is a good substitute for all body framing except the sills. There are the rock, red and white or gray. Sound gray elm with ash or maple sills and oak floorboards is as good a combination as any body, even the finest job, will require. It has the advantage both of strength and light weight. Elm has always been considered the best wood for the trim rail of touring cars, as it will stand the punishment of being drawn down to uneven metal surfaces with bolts with out checking. No other wood has the same qualities of endurance and adaptability for the exacting work required of the common trim rail on touring and runabout bodies.

Beech, Birch and Chestnut

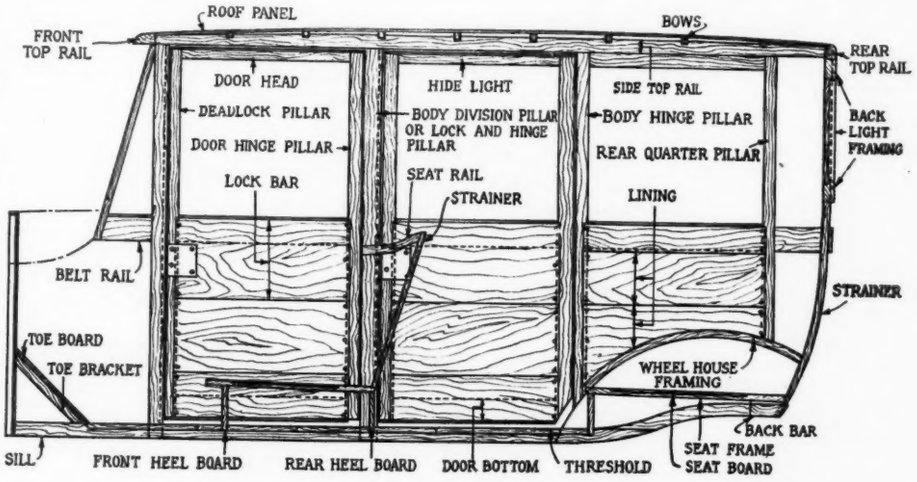
Beech and birch are somewhat of the nature of the maple. They do not come into use in sufficient quantities to be a factor.

Chestnut is a wood that resembles oak in appearance, except for the color, which is somewhat the tint of the straw. It has never been much used in body work, on account of checks developing after the body had been framed up. However, when it can be secured it makes good framing stock. It can be used to advantage as floorboards, seat frames and framing, except sills.

Red gum has only come into use of late as a body asset. It is a close-grained wood, stains well and has been used for furniture and interior finish. Its disadvantages have been that it warps and twists badly in drying and wastes greatly, as the twist will at times be the full thickness of the board. It has been proven recently, however that this wood can be kiln-dried and made to compare favorably in non-twisting qualities with other lumber. Its value has increased correspondingly, and it has and is being used for most parts of the frame except the sills. Bodies have been made and given good service in which gum has been used for the entire frame, even the sills. Usually, however, its use is confined to seat frames, strainers, etc.

Sycamore is not much used because it is not abundant in the market. It compares in strength with the best grade of gum and makes up well as a natural finish.

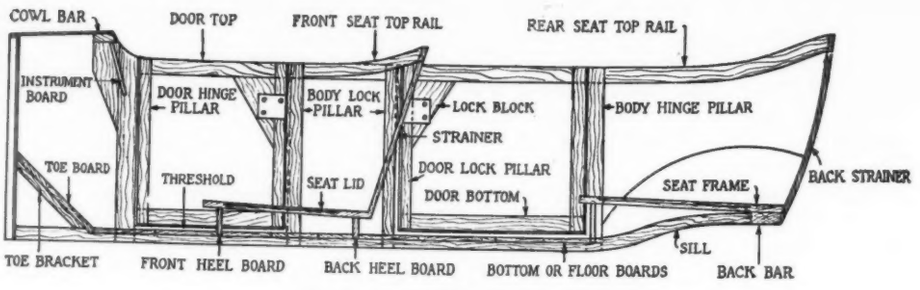
Seat boards are made of soft wood and, as narrow strips can be used for this, waste stock is generally used to fill the needs. Culls of whitewood are generally preferred,



The woodwork in an enclosed body

but almost any wood that does not have a resinous sap will be good enough.

The two illustrations show the framework of an open and a closed body. The views are longitudinal sections along the center line and the interior view of the right side is shown. All the pieces of woodwork are named; where the piece is duplicated, the name is not repeated.



The framework in an open body

It can be readily understood from these diagrams that the quality of wood does not need to be high class for all the parts; in fact, once you have become accustomed to thinking of substituting the cheaper grades in places where strength is not essential, automatically one is surprised that it has not been done earlier. Of course, practical men have always realized what are essential requirements for strength in the various pieces making up the framing. It has been the builder's business reputation, however, on the one hand and specifications made up for their advertising value on the other that have kept conditions stationary. It makes a good talking point to say selected ash framing to the car buyer but in practice just as good results are obtained by using any alive and sound hard lumber. The terms alive and dead are used in speaking of wood. But this has no application to the age or use that the timber may have had. It refers to decay or dry rot and the disintegrating forces set up in the process.

The sills and the door pillars, the latter particularly on closed bodies, are the essentials. The sills must be of good sound stock and strong, because the chassis frame may or may not give the required support. Generally they do, but the sills must be rigid to keep the door openings true so as to prevent binding of the doors when opening and closing and, in open bodies, the sills could be broken entirely through at the doorway when handling. Closed bodies have a roof that prevents this buckling, but an open job has no reinforcement to the sill at this point.

Lock Pillars of the Doors

On closed bodies, as the lock pillars of the door are the weakest part, these pillars are made with a spring in them. That is, they are made to have a tension when locked; therefore, there is a constant strain in use and naturally the best wood will give out in time. Except for these places mentioned, there are no parts of the frame that require careful nursing; the floor or bottom boards are the best of oak, ash or chestnut because they have resisting qualities against the action of rotting from water, particularly the first-named wood. Of ash or chestnut, probably the latter may have a little the advantage in this respect and, speaking from past experience, the writer has had bodies brought in for repairs showing that the forest growth or soft ash resists the rot from water contact better than the stronger white or second growth. Maple is not a good wood to use where it will be subject to much wetting but necessity compels us to disregard this condition for sills as it is one of the few woods available that are strong enough and in sufficient quantities in the market. The quality of resisting the decay from water rot is not as essential as generally supposed; it is largely imaginary to suppose a body will pass the other stages of its ills long enough to have the water vitally affect it.

Viewing the two illustrations finally, it will be seen that the process of manufacture whereby the frame is encased and supported by a metal shell generally of 20-gage steel, is a condition that makes the frame of relatively minor importance in many places on the touring body, and to some extent on the closed job. As stated before, there are bodies that depend upon wood only for floorboards and rails for fastening the trimming tacks and, between the bodies made in this manner and those with frames as illustrated, there are many variations in which wood is dispensed with at the less essential places so that it is fair to say the open body will become more and more an all-metal job as time goes on.

Closed bodies are not so easy to make in this manner but the large size of many of the pieces makes it possible to use soft wood. In fact it has been the practice, even in the carriage days, to make some of the pillars and the top rail of bass—sometimes called linnwood and whitewood. It only remains for the automobile manufacturer to be willing to accept the judgment of the body man and have the specifications read so as to permit him to use the woods available in the manner best suited.

The statement is emphasized again, that as bodies are now constructed with steel panels shaped and welded together, there is sufficient strength in the panels alone to withstand the strain and the wood for the major part is simply a filler in to get size or thickness, to hold the bolts and screws and to fasten the trimming. Therefore, this article will have failed its purpose if it does not serve as an influence in inducing those responsible in making out specifications to be more generous in the latitude allowed the body maker as to the wood to be used.

The wood must be sound and alive. This is the prime essential. The sills and doors must be hard lumber and strong and the other parts can be graded down, making use of any wood of the list mentioned.

Aircraft Committee Reports

COPIES of the following reports of the National Advisory Committee for Aeronautics have recently been received:

No. 46.—A Study of Airplane Engine Tests, by Victor R. Gage.

No. 47.—Power Characteristics of Fuels for Aircraft Engines, by H. C. Dickinson, W. S. James, E. W. Roberts, V. R. Gage and D. R. Harper, 3d.

No. 55.—Investigation of the Muffling Problem of Airplane Engines, by G. B. Upton and V. R. Gage.

No. 61.—Head Resistance Due to Radiators, by R. V. Kleinschmidt and S. R. Parsons.

Copies of these reports can be obtained from the National Advisory Committee at Washington.

THE French Secretary for Aviation and Transport has appointed a technical and consulting committee for the general improvement and furtherance of aviation in France. The committee will deal with research work, aerodynamics, improvements of all kinds, inventions, aerial navigation, and instruction and examination in all branches of aviation.

A Review of the Methods and Operations of Japanning Practice

AUTOMOTIVE INDUSTRIES, in its issues of March 11 and March 18, this year, published a two-part article on Japanning Practice by W. A. Darrah. This is a constructive criticism and an explanation of Mr. Darrah's points.

By Carl J. Schumann*

THE splendid article by Mr. W. A. Darrah, "A Study of the Methods and Operations of Japanning Practice," recently published in AUTOMOTIVE INDUSTRIES, added to the all too limited printed word on this subject so vital to the automotive industry. The desire in discussing various points in Mr. Darrah's article is entirely with a view of correcting some technical errors and offering constructive criticism which it is felt will be for the good of the industry.

The black baking japan finish now used on automobiles is but the grandchild of the black japan finish so common on pen holder handles in the days of our parents. Manufacturing recipes of a century ago are used to-day because those were good recipes and it has been almost impossible to improve on them.

The term "rubber coat" or "rubber finish" has come into use because of the similarity in appearance of the finish obtained with pigment black japan to the finish of molded rubber parts. Rubber will not mix with linseed oil and it is not employed in making japans. The "rubber" appearance of the first coat japan is due entirely to the pigment and oil combination.

Mr. Darrah speaks of the relatively small use of black pitches or gums. Black asphaltum, or "Gilsonite," gives to the finishing black baking japans on automobiles, its color, its luster and to some extent its hardness. In the cheap black japans used largely on castings, black pitch gives the color. Finishing japans are known as "clear japans," that is, they contain no pigment. Carbon black is used in first coat japan, because it hides densely and the first coater will cover black on sharp edges where finishing japans, because of the thin film, would show up with a brownish cast.

The dryers used in making japans are all organic or inorganic salts of lead, manganese and cobalt; dryers that are entirely organic are not used. Dryers (in liquid form) as sold commercially should not be mixed with baking japan, as such mixture probably will lead to trouble.

The Viscosity

The viscosity at which a japan should be used is more frequently spoken of as the Baumé or Specific Gravity. One japan and one solvent should be mixed in varying proportions to determine by practical tests what proportion gives the best results. The specific gravity of that particular japan and of that particular solvent and the specific gravity of the resulting mixture should be taken and the latter figures always used for those goods. Each specific gravity is good only for that combination and does not hold good if some other japan or some other solvent is used.

The above point is of the greatest importance in testing goods of another make than that ordinarily used. All too frequently new goods are only tested and reduced to the specific gravity at which the old goods were worked. If the result is satisfactory, O. K.; if not, the new goods are condemned. That is not fair. The specific gravity of the new goods should be taken and the proper working mixture determined and the specific gravity observed. The reduction figures and the prices give an index of which japan is more economical.

Buying on the Price Basis

As a good automobile finishing japan weathers anywhere from two to three years, depending upon the care taken of the machine, it is seen that an actual life test is almost out of the question. As the author says, "a trial application or tests of the resulting enamelled surface is a successful and reasonable basis for selecting japans." It is unfortunately too true, that some of the largest automobile manufacturers set a price which they are willing to pay for their baking japan and place the business with the manufacturer who will meet that price.

In speaking of the gums used in making japans, your author is correct in saying that the higher grade japans contain the more expensive gums, that is the better quality of "Gilsonite." Some very cheap japans are made from stearine pitch or other pitches. Shellac cannot be used in making baking japan. Shellac is sometimes used in what is known as a grinding japan, a vehicle in which colors are ground to make the so-called "color in japan," used as a foundation color coat on automobile body work.

The writer is in most hearty accord with your author's findings on requirements as to adequate supervision, storage, mixing equipment, etc., the use of proper viscosity standards, the keeping of japan at uniform temperature, etc.

It is true that even the highest grades of japans which contain pigment will deposit some of the heavier ingredients on long standing. The finishing japans which contain no pigment have nothing to deposit.

As to the application of material by the spraying method—where this is done with proper equipment—that is a hood in which the work is placed during the spraying operation, such hoods equipped with adequate exhaust fan there is really no inconvenience to the operator.

In speaking of the spraying methods, your author says, "with the painting of chassis and similar parts that do not require a high grade finish." Why should not the chassis be finished with just as high grade durable ma-

*Mr. Schumann is secretary of the Hilo Varnish Corp.

terials as is used on the hood, fenders, radiator, shell, wheels and body? Why finish a chassis with material which will begin to go to pieces in six months, when the finish on the fender will stand up for three years? Unfortunately, such is the condition. In the writer's opinion this is brought about largely because the finish on the chassis is sacrificed to production schedules. In some plants their schedule calls for not even removing the poor primer which is put on the chassis frame as a rust preventative by the maker and the automobile manufacturer wants to put over this only one coat of material. This he puts through a temperature of 150 deg. Fahr. for 45 min. and then expects the finish to be dry enough so that he can proceed to assemble. Such a finish is not at all worthy of even the lowest priced cars.

In preparing estimates of the japan needed for a production, say of 100 cars per day, assuming that one coat of first coat and two of finishing are used, the question would be, how many gallons of each japan and how many gallons of reducer are required to take care of this output of fenders, etc., for 100 cars per day. The estimator is faced with the question of not how much material is left on the surface when finished; he reasons, if three gallons of japan are reduced with two gallons of solvent, how many square feet of surface will the combination of five gallons cover. When applied by the dip method, one gallon of material so reduced should cover at least 600 sq. ft. of surface, that is, 300 sq. ft. of metal covered, one coat on two sides. The estimate of 600 sq. ft. per gallon of reduced material is fairly correct. On such basis it is easy to calculate approximately the amount of japan needed.

One cannot help but reiterate your author's statement, "It is good practice to clean thoroughly the metal surface before applying the japan coating." Nowhere is this better realized than on any work where the japanning is done on brass, for the least grease mark or finger mark shows even through several coats of japan. On steel, unless grease and rust are removed the japan finish will not be smooth and will tend to come off, often after only a few months of service.

Of cleaning processes, it should be added to those mentioned by your author that of first washing the parts in a boiling solution of Oakite or similar cleaner, and then in boiling water.

Your author's information about baking equipment is very good indeed.

It might be well to point out the reason manufacturers of baking japans prefer to have their goods baked at the lowest possible temperature. When baking at low temperatures, if through some error the temperature is ten or twenty degrees higher or for some reason the time of baking is fifteen to twenty minutes longer, there would be no danger of spoiled work. In the case of high temperatures for a short period of time, an additional twenty-five degrees temperature, or an additional ten minutes time might overbake the japan and cause it to chip from the metal. The best qualities of black baking japans may be satisfactorily baked at somewhat lower temperatures than given, that is, at 300 deg. Fahr. for 3 hr.

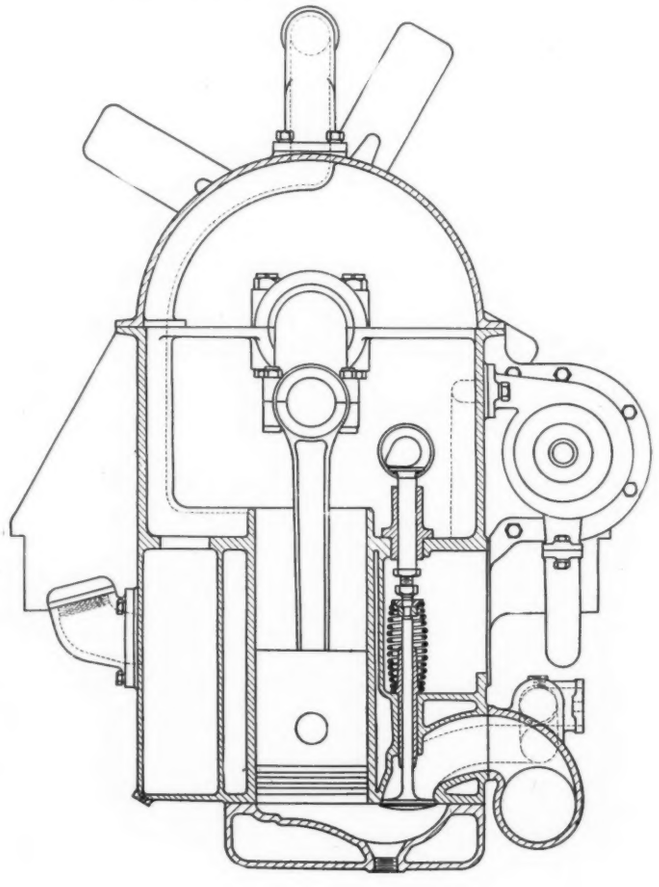
Inverted Engine for Burning Kerosene

THERE seems to be a general impression that the large cylinder horizontal engines which characterize some of the older tractors are "getting away" with kerosene much better than the four-cylinder engines which are used on most of the newer tractors. This is probably partly due to the greater heat in the larger cylinders, which results in the vaporization of a larger proportion of the fuel. In a combustion chamber the amount of heat liberated increases as the cube of the linear dimensions while the cooling surface increases only as the square of the linear dimensions, hence the heat cannot escape so quickly from a large combustion chamber and the temperature undoubtedly attains a higher value.

Another factor is the arrangement of the cylinders. In a vertical cylinder any unvaporized fuel naturally tends to drain into the crank chamber, and some designers bevel off the top edge of the pistons, thus making the path as easy as possible. If the cylinder is horizontal the force of gravity does not influence any unconsumed fuel to flow toward the crank chamber, if there is a remnant of fuel after an explosion it may be vaporized and consumed during subsequent strokes, or else expelled from the cylinder with the exhaust.

W. H. Johnson, of the Dart Motor Truck Co., has designed a four-cylinder tractor engine for kerosene in which the cylinders are inverted. The object is to cope with the crankcase oil dilution difficulty. This arrangement of the cylinders necessitates full force feed oiling, except for the cylinders, which are lubricated by the spray from the crankshaft. To prevent too much of this spray getting into the cylinders, the barrels are extended up into the crankcase a short distance. The oil collecting on the crankchamber walls is thus drained off into an oil reservoir cast alongside the cylinders.

One advantage of the inverted engine is that the belt pulley can be driven directly. The water outlet pipe is cast on the inside of the crankcase. The engine is still in the development stage.



Foundry Production and the Structure of the Plant

A small Eastern foundry presents many features of modern foundry practice which are conducive to increased production and decreased turnover. The following article tells, among other things, how one foundry was able to keep men at work through the hot days of last summer.

THE improved construction of modern foundry buildings is an important factor in the betterment of foundry working conditions. Improvements both in equipment and methods, which might be impossible in an old building, can be advantageously applied in a new structure. For this reason, the path toward ultimate progress in foundry development is likely to be found through the new plant, rather than through the old structure to which improvements have been added.

The possibilities of modern foundry construction and production methods are illustrated well in a small foundry recently erected in New England. Its small size makes it especially interesting, since the theory of the building construction and production system can easily be seen in perspective without exhaustive study and investigation.

The entire foundry, including some 1033 sq. ft. of office space, covers an area of 10,757 sq. ft. The average working force is about 42 to 45 men. The work is such that only two core-makers are necessary, while most of the molding is done by machine. There are six of these machines, four of which are usually in operation. Two or three expert hand molders are kept at work.

The building construction is modern in every respect, the roof being about 35 ft. high at the center and about 24 ft. at the sides. The sides of the molding room are almost entirely of glass, while the room in which the metal is heated has sides which can be opened in sections. This arrangement gives ample light and permits proper ventilation without danger of drafts.

Adequate and cleanly toilet facilities are, of course, provided, including wash basins, shower baths, lockers, etc. Here, as in many other places, the men take advantage of the wash basins much more extensively than of the shower baths. The structure is steam heated throughout.

The work produced in this foundry, chiefly for railroad cars and locomotives, consists of journal bearings, engine castings, etc. Bushings for automobiles are also made. A great deal of repetition work is done but changes are necessary often enough to prevent a system of quantity production such as is planned for the new Lycoming foundry. The production of this plant averages about 350,000 lb. per month, a high total considering the type of castings made and the number of men employed.

The floor plan shown in the accompanying drawing illustrates a number of features which embody the best modern practice in foundry construction. The building is divided into sections which are practically separate. The room where the metal is heated is separated by a wide partition from the section in which the molders work. Doorways at each side, however, connect the two rooms. The partition prevents the smoke which arises when the oil furnaces are being started and the terrific heat later generated from spreading readily throughout the entire building.

The sides of the melting room, as previously noted, are so constructed that they can be opened in section to permit the best possible ventilation. When all three sides are down on a hot summer day, the men working there are assured of any air that may be stirring. Though work near such furnaces must of necessity be hot and unpleasant at certain times, conditions in this foundry are much better than the average, since the excellent ventilation makes the heat extreme only in the area directly surrounding the furnaces.

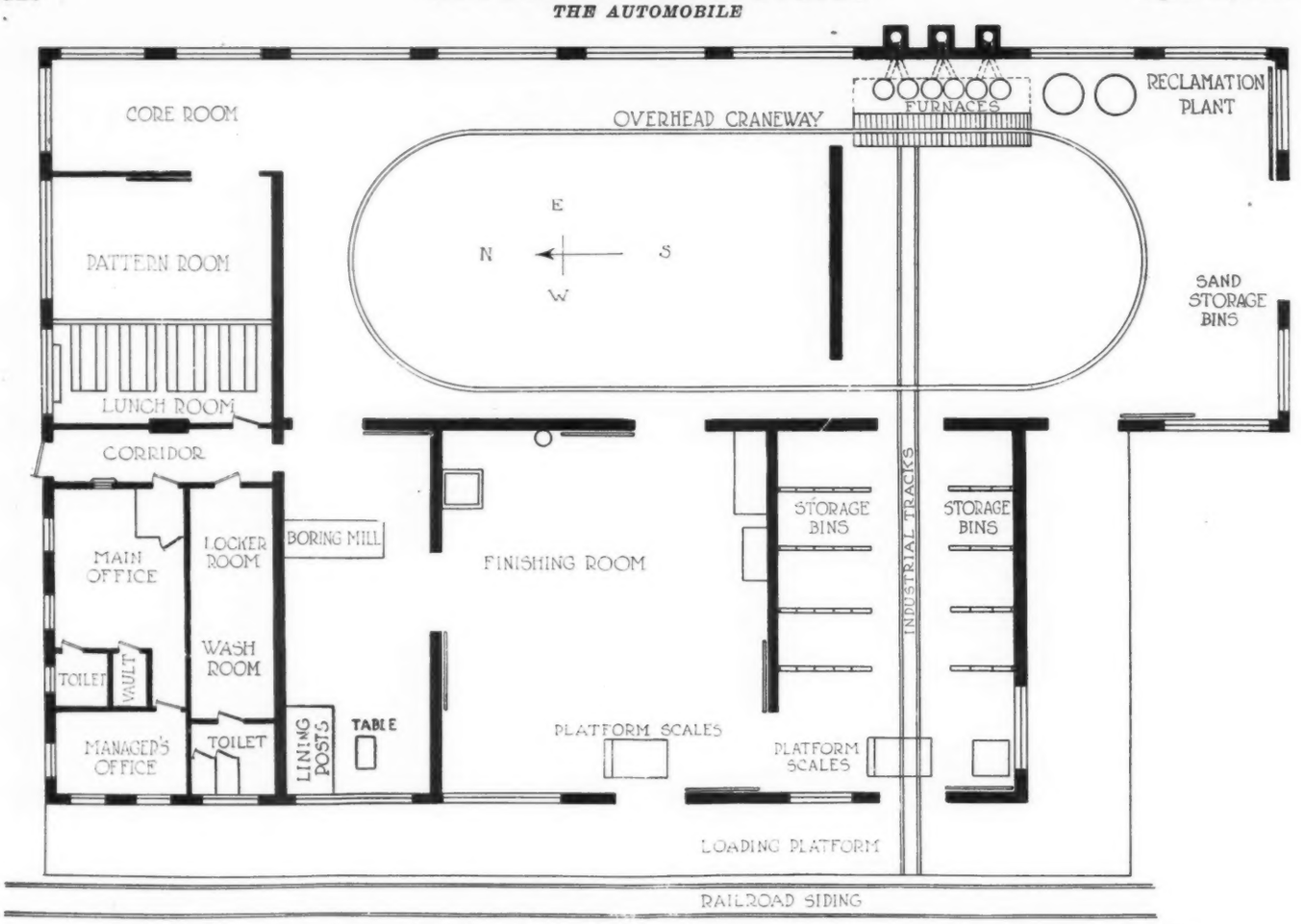
The windows which comprise the walls of the molding room can also be opened in sections. The ventilation is so regulated as to carry off almost at once the dust arising from mixing sand and the gases from the molds. Even when some molds are being poured and others are being shaken out simultaneously, the atmosphere is clear and pleasant to breathe.

In a separate room adjoining the molding section is the finishing room where the castings are cleaned and chipped. The dust resulting from the cleaning process and the chips flying from the castings are thus segregated from the main part of the shop. Tumblers are used for cleaning, while only the rough edges are chipped off.

Under these excellent working conditions an effective production system for a small foundry has been developed. The sand for molding is stored in concrete bins at the south end of the building and is carried by wheelbarrows through the melting room to the molding room for mixing. It is expedient to do this because the amount of sand thus carried in one day is far too small to warrant a conveyor or similar mechanical laboring device.

The molders work chiefly at the north end of the molding room, each one mixing his own sand. As the molds are finished, they are lined up along the west side of the room. An overhead crane running on an oval track, as indicated in the drawing, is used to carry the hot metal from the furnaces to the molds. The metal is then poured and the molds are allowed to cool in their places.

The molds are finally shaken out at the south end of the molding room, near the partition which separates that room from the furnace section. Although thirty or forty molds are poured at a time and although a number are subsequently shaken out in rapid succession, the construction of the building allows such excellent ventilation as to prevent the air being unpleasantly full of gases or the light being obstructed by steam or dust.



Ground plan of a small foundry, illustrating relation of building structure and plant layout to working conditions

The oval track of the overhead crane permits the use of the machine in carrying castings to their place in the pouring line and for the conveyance of heavy materials from one part of the shop to another. It has been found more economical for work of this type, which changes frequently and often requires careful pouring, to carry the metal to the molds for pouring rather than to carry the molds on a conveyor to a central pouring point.

Having cooled and having been shaken out, the castings go into the adjacent finishing room, where they are tumbled and chipped. A small machine shop is operated for repair work, but no machine work is done on castings. From the finishing room the castings go to the boring mill, where such castings as journal bearings, etc., are bored and lined with babbitt metal.

The castings are then ready for shipment and are trucked to the loading platforms on the west side of the building. A railroad siding provides ready shipping facilities.

The experience of this well-equipped foundry during the hot days of last year is especially interesting, since authorities are predicting a crisis in foundry production during the coming summer. The effective ventilation and working conditions enabled the shop to run without shutting down for even one day during the hot spells of last summer—a record not equalled by many foundries.

Although affected by the general spirit of unrest, as in other foundries, the labor turnover is low enough to warrant the belief that working conditions are a definite factor in reducing it. Accurate turnover records have not been kept, but a conservative estimate places it at about 23 per cent a month, and it is a highly favorable result as compared with many automobile foundries. The average turnover in automotive plants in Detroit, for instance, has been close to 21 per cent for some months, while the foundry rate is usually about twice as high as the average for an entire plant. It has been found, also, in this New England foundry that men need less time off on account of illness than in foundries of a similar size where disagreeable working conditions prevail.

This foundry has its problems and troubles as does any other plant working under present-day conditions, but the advantages of modern equipment, excellent working conditions and a properly constructed foundry building are found to be significant factors in overcoming to a large extent the evils of labor turnover and curtailed production. Though no special effort has been made to approach the foundry problem from the human side, the results achieved in this plant have thoroughly "sold" the idea of good working conditions to the management.

ACCORDING to a paper read in Berlin by Dr. Wittefield on Future Heat Engineering, development of the Holzwarth Gas Turbine (which has been repeatedly mentioned in AUTOMOTIVE INDUSTRIES) has reached a stage where the German railroad administration felt justified in placing an order for a 3300-kw. turbine generating plant for the railroad power station in Muldenstein. There is also in course of construction a (railroad) motor car with oil turbine, a power plant which should prove applicable to marine propulsion as well.

Foreign Tire Import Duties

THE following table, corrected to March 15 by the Bureau of Foreign and Domestic Commerce, which was originally compiled for the *India Rubber World*, includes foreign import duties on rubber tires and export duties to various countries from the United States. Such charges as warehousing, customs handling, local taxes, etc., are not included and the rates of duties including surtaxes as noted, should, consequently, be regarded as the minimum. These duties change frequently and hence it would be advisable to correct the table as often as will be found necessary.

The column marked "weight" denotes whether duties are levied on net or gross weight or simply inner packings. The second column gives the rate of the duty for each 100 lb. in United States currency, and the third column the rate per cent ad valorem.

Countries.	Weight.	Rate per 100 lb.	% Ad Valorem.
Canada			42.5
(Ad valorem duties are based on the fair market value of the articles when sold for home consumption in the country whence exported direct to Canada.)			
Central American States—			
British Honduras			25
(Duties based on price in the port of export)			
Costa Rica	Gross	$4.22	
(In addition, there is a wharfage tax of 10.5 cents per 100 lb.)			
Gautemala	Gross	7.21	
Honduras	Gross	4.36	
Nicaragua—Tires, inner tubes for Auto tires.... / Solid tires... / Mo'cycle tires	Net	27.27	
Panama			15
Salvador	Gross	13.81	
(A surtax of 11½ per cent of the duty is included.)			
Hawaii			Free
(Imports from foreign countries are subject to the United States tariff.)			
Mexico—Auto and motorcycle tires			
Solid		11.28	
Pneumatic	Gross	22.56	
Bicycle tires	Legal	22.56	
(Not including variable paper surtax.)			
Newfoundland			49.5
(A surtax of 10 per cent of the duty is included.)			
West Indies—			
British—			
•Antigua			13.33
†Bahamas			25
•Barbados			11.25
Bermuda			11
•Dominica			12.5
•Grenada			10
Jamaica			16.66
(Tires for motor vehicles are subject to a surtax of 20 per cent.)			
•Montserrat			13.33
•St. Christopher-Nevis			11
•St. Lucia			16.5
•St. Vincent			12.5
•Trinidad and Tobago			10
Turks and Caicos Islands			10
Virgin Islands.			10

•When imported from the United Kingdom, Canada or Newfoundland, admitted at a reduction of one-fifth of the duty. The cost of packing is excluded, except in Dominica, St. Lucia and Grenada, where it is included.
†A surtax of 10 per cent is included.

Cuba			25
Dominican Republic—			
Tires for autos, cycles, etc....	Net	5.69	
Tire for trucks.		Free	
Dutch Colonies...			3
French—			
Guadeloupe			6
Martinique (rates not specified).			
(Imports of other than French origin pay also the regular French import duties.)			
Haiti			22.24
Porto Rico			Free
(Imports from foreign countries are subject to the provisions of the United States tariff.)			
Virgin Islands of the United States.			Free
(Imports from foreign countries are temporarily subject to the duties formerly in force in the Danish West Indies.)			
SOUTH AMERICA:			
Argentina—			
Auto and solid tires	Legal	28.02	
Bolivia	Gross	20.29	
Brazil—Auto tires of Para rubber..			12.51
Other auto tires.			28.89
Motor truck tires			12.51
Chile	Gross	9.93	
Colombia	Gross	0.97	
Ecuador	Legal	9.93	
Guiana—British			16.5
(When imported from the United Kingdom, Canada or Newfoundland, admitted at a reduction of one-fifth of the duty.)			
Dutch			10
French			5
(The regular French import duties are also collected on goods not of French origin.)			
Paraguay—			
Auto tires.	Legal	60.93	
Bicycle and motor-cycle tires.	Legal	76.16	
Peru—Auto tires...	Gross	24.28	
Other tires.	Legal	36.42	
Uruguay			45
Venezuela	Gross	10.28	
EUROPE:			
Austria-Hungary	Net	13.81	
Belgium—Solid tires	Net	5.69	
Auto tires. (Casings only.)	Net	10.16	
Inner tubes.	Net	14.88	
Bulgaria—Tires and tubes.	Net	5.25	
Denmark—			
Auto tires.	Net	6.08	
Solid tires			Free
Czechoslovakia—			
Tires and tubes..	Net	13.13	
Faroe Islands.			Free
Finland—			
Auto tires.. / Inner tubes	Legal	$12.55	
France—Auto tires and tubes.	Net	17.07	
Solid tires.	Net	11.38	
Cycle tires	Net	37.54	
Germany—			
Auto tires.	Net	6.48	
Inner tubes.	Net	6.48	
Gibraltar			Free
Greece	Net	1.03	
Iceland	Net	0.24	
Italy—Auto tires and tubes	Net	5.25	
Malta			5
Netherlands			5
Norway—Auto tires	Net	3.65	
Motorcycle tires..	Net	3.65	
Portugal	Net	1.60	
(Conversion to U. S. currency is based on the latest quotation of the paper milreis.)			
Roumania—			
Auto tires.	Legal	9.06	2% ad val.
Solid tires.	Legal	4.90	2% ad val.
Servia (Jugo-Slov.)	Net	13.16	
Spain—Solid tires..	Net	17.51	
Casings and inner tubes	Net	23.64	
Sweden—Auto tires	Net	14.59	
Solid tires	Net	9.73	
Switzerland—			
Auto tires	Gross	0.44	
Solid tires	Gross	0.09	
Turkey		15.00	
United Kingdom...			Free
ASIA:			
British—			
Aden			Free
Ceylon			7.5
(Duty based on wholesale cash price in bond, less trade discount at the port of entry.)			
Cypress			10
(Duty based on export price with addition of cost of transport [including insurance] to the port of final discharge.)			
Federated Malay States			10
Hongkong			Free
India			7.5
(See note to Ceylon.)			
North Borneo			10
Sarawak			Free
Straits Settlem'ts			Free
China			5
Chosen (Korea)			8
(After Aug., 1920, the Japanese tariff applies.)			
Dutch E. Indies...			10
French Indo-China.			
(Imports from France are admitted free of duty, while imports from other countries are subject to the rates prescribed by the customs tariff of France.)			
Japan (including Formosa)—			
Auto tires.			25
Cycle tires.	Net	$42.92	
Persia			10
Siam			3
Syria			11
(Plus 1% if by Egypt.)			
AFRICA:			
Abyssinia			10
Belgian Congo			10
British—			
Mauritius			12
Nigeria			Free
Union of S. Africa			20
(Duty based on the current value for home consumption at the place of purchase, including value of packing and agent's commission if it exceeds 5 per cent.)			
Zanzibar			7.5
(The dutiable value of imports from Europe or America is taken to be the cost price [with charges], increased by 5 per cent or the invoice price [exclusive of charges], increased by 15 per cent.)			
Egypt			8
(In Alexandria a wharfage tax of one-half of 1 per cent is added. At other ports different rates are imposed.)			
French Algeria.			
(Imports from France are admitted free of duty, while imports from other countries are subject to the rates prescribed by the customs tariff of France.)			
Italian—			
Eritrea			8
Libia			11
Somaliland			15
Liberia			12.5
Morocco			12.5
OCEANIA:			
British—			
Australia			35
(Duty based on fair market value F.O.B. at port of export, plus 10 per cent. On casings weighing over 2½ lb. and inner tubes over 1 lb. each, 48.6 cents per lb., if higher than the ad valorem rate.)			
New Zealand			1
Guam			Free
(Imports of foreign origin are taxed 25 per cent of their value.)			
Philippine Islands.			Free
(Imports of foreign origin are taxed 25 per cent of their value.)			
Tutuila			10

Legal weight is not uniformly construed but generally includes the weight of the immediate packing or container, though in some countries fixed tare allowances are made.

The Vehicle Maker's Responsibility for Repairing of Assembled Units

The writer of this article assumes that the maker must see that the vehicle must be kept going and, if his dealer is not entirely competent to handle repairs on certain intricate equipment, it is the manufacturer who must see that this service is provided. This is a part of the marketing plan.

By E. A. Haskins*

An immediate clarification of the subject under consideration is obtained if we change the two words, service relation, to maintenance relations, and the much-buffeted word, service, can be relieved of its mystery if given the common sense interpretation, "Maintenance." I will, therefore, ask your consideration of the subject, "Maintenance Relations Between Parts Manufacturer, Vehicle Manufacturer, the Distributer, Dealer and Owner."

In the following discussion, we may use the term dealer in a general sense meaning the vehicle manufacturer's distributing organization. We will also make two general subdivisions; one the furnishing of parts, and the other their installation, under which will come the general discussion of instruction.

If every seller of merchandise only would have vision enough to realize the value of proper maintenance, this subject would need no discussion. Under existing conditions, however, the future sales value—good-will, if you please—resulting from legitimate business-like efforts to keep equipment in operation, has been subservient to the idea of production, immediate sales and immediate profit.

Some seem to have considered the maintenance problem as a burden or a necessary evil rather than one of the important divisions essential to the continued popularity and sale of their product. Others have surrounded it with a veil of mystery, intimating that there is only one place to secure parts and only one way in which parts can be made to perform satisfactorily the function intended. This does not apply to parts other than those covered by the subject under consideration.

To get down to particulars, we like to think of maintenance as vital but still incidental to the real problem, that is, the sale of the finished product. We are not in business to sell parts but to keep equipment in operation. We are not vitally interested where the customer secures supplies necessary to maintain his vehicles as long as parts are up to the standard necessary to secure best results.

The Chain of Interdependence

There are two ways of visualizing the interdependence of all parties under discussion. First: Consider each as a link in a chain, each one responsible to the link on either side; starting with the parts maker as the ring and through the vehicle maker, distributer, dealer to owner, we find owner—the man who pays all our bills—dependent for satisfaction upon the parts maker. Mr. Owner does not necessarily appreciate this fact and if dealer, distributer and vehicle manufacturer, especially the latter, are measuring up to their responsibility, or rather opportunity, the owner will not need to have this forced to his attention. Likewise, dealer, distributer and, finally, the vehicle maker are hampered or helped by the parts maker's maintenance facilities.

The Manufacturer

Let us not throw too much of the load upon the ring end of the chain. Let the vehicle manufacturer consider himself as a wholesaler or jobber carrying a stock of suitable size to cover several months' requirements and endeavoring to educate the distributer and dealer to appreciate that they are the retail organization and upon them rests the opportunity of carrying a stock sufficient to care for day-to-day demands so that the hook end of the chain will really assist in catching additional buyers.

Second: Consider a pyramid with parts maker at the apex and owner at the base. All our increase in business is based on owner's satisfaction. If parts maker's product or service is not up to standard, the owner will spread his feeling of dissatisfaction so thoroughly as to ultimately hinder parts maker's sales and he is, or should be, vitally interested in owner's satisfaction, even though he does not get into personal contact with the owner, as do the other interested parties.

Now for the price. Everything bears a price—even satisfactory service costs something. The question of discount and list price has caused much discussion. It is manifestly unfair for the parts maker to establish list prices and discounts so that the price to owner, if passed direct by him, is much different than when handled by vehicle manufacturer and his distributing organization. I say much different advisedly, for it has never been our policy to attempt to hold to parts maker's list if this provided a greater or less profit than considered legitimate.

We have endeavored to make our Service and Parts Division sufficiently attractive so that after the dealer has been properly started by vehicle manufacturer he will have real financial reasons for keeping it up. The real fundamental of maintenance is speed or promptness of repairs. What matters a few cents more or less compared to a vehicle tied up for several hours or days?

It would greatly simplify matters, therefore, if the parts maker would establish a discount sufficient to enable his list price to mean something only as a comparison. Let him protect the vehicle manufacturer regarding deliveries and not supply owners or dealers direct when he is not shipping some parts to the vehicle manufacturer, who may have orders for similar parts which have remained unfilled for some period.

If the distributer is worthy of the name, let him be

*Mr. Haskins is service manager of the Federal Motor Truck Co.

the headquarters for parts and repairs in his territory. If the party nearest the owner is honestly trying to give service, justify his efforts, and do no more yourself than you are legitimately asking him to do. Do not let anyone get the impression that he can get any more by going over the dealer's head.

Let us all protect the party next in line on the hook end of the chain whenever he is trying his best, but, of paramount importance, keep the owner happy, even at the sacrifice of pride or immediate profit. I have no patience with the dealer who is not trying his best to help—factory assistance on more than one occasion may have cost him money.

If the parts manufacturer's product is of a specialized nature demanding more care, knowledge or experience in its maintenance then can be expected of the vehicle manufacturer dealer's force, let the parts manufacturer establish his own widespread repair system and work with the dealer in caring for such work. We can see no reason why the vehicle manufacturer should receive any remuneration in any fashion from such work which has been performed without his knowledge or assistance and without material in which he has his money invested.

The parts manufacturer should appreciate the necessity of keeping the vehicle manufacturer informed in advance of proposed changes in design, so that we all have an opportunity of preparing to care for these changes and not wait until such changes are in production.

An ideal way, therefore, is to have the owner cared for by the dealer who has a reasonable stock of most active repair parts and dependent upon the distributer for replenishment of his stock and for parts seldom used, as well as expert mechanical assistance and instruction. The distributer, in turn, depends upon the vehicle manufacturer for his supply of parts so that his efforts can be roughly checked. Failure of any one of these should permit the owner to receive prompt and immediate attention from the parts maker in such a way that the other parties may be kept informed of their shortcomings and proper action taken to prevent repetition.

The price demanded by the parts maker from the owner should be sufficient to discourage such relations if the dealer is trying honestly to maintain the owner's equipment. We believe that the parts maker's price should be greater than the vehicle manufacturer's list so as to discourage direct dealing, unless the vehicle maker or dealer is not making an honest effort in the owner's behalf.

The furnishing of parts is given the position of importance due to its being by far the most important feature of satisfactory maintenance. Parts themselves, however, are of little value unless properly installed. Therefore, every vehicle manufacturer should be able to secure suitable instruction from the parts maker so that he can in turn properly instruct the dealer's organization by means of shop courses, schools and printed instructions.

Let us all help, not hinder. There is no such thing as free service. Therefore, if it costs money, charge for it; if we are wrong, admit it. Give uniform treatment. Make anything worth while worth money and some of our problems will be simplified.

A New All Fuel Carbureter

SEVERAL kerosene burning tractor engines are equipped with the Holley All Fuel Carbureter, designed to vaporize thoroughly the fuel without excessive preheating. This is a development of the kerosene burning equipment originally developed by Holley for the Fordson tractor. The method utilized consists in converting the kerosene into a gas, by applying to it some of the exhaust heat, and then mixing this gas with cold air. After passing the metering jet, the fuel, together with a small quantity of air, is drawn through the vaporizing tube, which is heated by exhaust gases. This vapor tube is in coil form, surrounded by the exhaust pipe, and the mixture which is drawn through it is too rich for combustion. After passing through the coil the mixture enters the carbureter at the throat of the venturi. Here it combines with the main air stream while the latter is at its highest velocity, and a combustible mixture is formed.

In installing the carbureter, it is mounted on the intake manifold in the usual position. Connected to the end of the exhaust manifold is a heater pot surrounding the vapor tubes, through which circulates all of the fuel used by the engine, but only a small proportion of the air. The exhaust gases heat the walls of the vapor tube sufficiently to vaporize any fuel that will evaporate below 600 deg. Fahr., it is claimed. This includes kerosene and any lighter fuels. For starting, a small tank with gasoline is coupled to the gasoline connection.

One of the features of the carbureter is the atomizer, which is a tube carrying air through its center and containing a series of jets arranged to be rotated in to register with either the starting fuel passage or the passage from the fuel chamber. This provides at the same time a means for shifting from the starting fuel to the regular running fuel and means for adjustment of the fuel feed. The fixed size jets prevent the operator from getting away from a working mixture, but allow him to secure the best results, considering climate and altitude.

In operation, after running a minute or two, the pointer is turned to working position No. 1, which is the largest fuel jet, giving the richest mixture. As the engine warms up the pointer is moved until the smallest jet on which it will run properly is reached. The temperature attained by the vapor issuing from the tube is about 160 deg. Fahr. The main air supply is controlled by the air valve, which regulates the amount of air and fuel drawn through the vapor tube and atomizer and maintains a correct proportion of fuel at all speeds and throttle openings.

For idling, sufficient air is drawn past the side of the air valve, which lifts to admit more air under its lower edge as the motor speed increases. The air passing at idling speed is regulated by the idling adjustment. When this is closed the mixture is richest, because the amount of air admitted is then smallest.

THE Geological Survey has made public statistics of production of soft coal by machines in 1918, published for the information of the Federal Bituminous Coal Commission in advance of the appearance of the Survey's regular annual report for 1918. The number of machines in use was found to be 18,463, an increase of 1,228 over 1917, and 2,265 over 1916. Tonnage mined by machines was 323,931,000, an increase of 17,535,000 tons, or 5.7 per cent as compared with 1917.

What Led Up to the Unauthorized Railroad Strike?

This labor disturbance that seemed to spring up overnight without forewarning and seemingly without cause is seen by Mr. Tipper as a matter of labor politics. The actions of the Four Brotherhoods and of Mr. Gompers are seen as corroborating these thoughts and of giving point to them.

By Harry Tipper

THE one distinguishing feature in the labor situation to-day is the unauthorized strike of railroad employees, the speed with which this strike has spread all over the country and the extent to which it has crippled railroad facilities at a time when the utmost movement of commodities was demanded for the continuance of industrial operations. There are many things about this particular strike which are marked as unusual in recent strike annals. These indicate that its purpose has behind it more important matters than the usual wage demand, and that it is concerned more definitely with labor politics.

For the first time in recent strike history, the organizers of the strike appear to be unknown, and there were no demands before the railroads when the strike itself was called. The man Grunau, a conductor who was demoted to a yard man, figures as the head of a new union which is supposed to be backing the strike. On the face of it, this explanation is evidently for public purposes. There is no reason to suppose that a rival union to one of the Four Brotherhoods could have been operated and developed to such strength without drawing the attention of the Brotherhood presidents long before this time.

Furthermore, in some of its characteristics, the strike is similar to certain of the tactics of the I. W. W. and some of the men who have been interested in I. W. W. affairs have been very active in its promotion. The fact that it did not cover one specific operation but extended through several of the occupations on the railroad and involved in some cases three of the Brotherhoods makes the matter take on the atmosphere of the one big railroad union, which, of course, is the I. W. W. idea. In one respect, however, it differs materially from anything heretofore promoted by the I. W. W. It is impossible to find the leaders of the strike in any of the localities, except the man Grunau, who has been mentioned previously, and there has been an unwonted secrecy as to the whole matter which does not agree with previous developments from an I. W. W. standpoint.

While the regular Brotherhoods have repudiated the strike and have authorized all union members to aid in any way in breaking the strike, they have not indicated that any very serious steps were being taken to discipline the strikers who are members of the Brotherhoods, to remove their union cards or to disown them in any way. In fact, this delicacy of the leaders of the Brotherhoods in dealing with the strikers is another surprising feature of the development of the strike at the time that this is written.

In view of these unusual elements, it is interesting to recapitulate some of the recent history in connection with the railroad labor question. It will be remembered that some time ago the Four Brotherhoods formally adopted the Plumb Plan as their idea of railroad operation and used their influence to give that plan all the publicity and all the backing which it could secure. It is to be recalled that hearings were held upon the matter in Congress and that since the Plumb Plan was suggested, the railroad Brotherhoods have brought the wage question to the attention of the President, claiming that the men were getting restless and it might not be possible to hold them. This claim as to the restlessness of the labor on the railroads was made a good many times and was the reason for the demands upon Director Hines just before the roads were to be returned to their original owners. The leaders of the Four Brotherhoods have shown themselves to be astute politicians, as well as labor leaders, and their actions since the Government took over the railroads have indicated their capacity to seize upon every advantage and use it for the development of the unions which they represent. It will be remembered that one of them has recently joined the American Federation of Labor and the indications are that the others will affiliate.

To add to the unusual character of the strike, it is necessary to call attention to Mr. Gompers' statement in respect to it. In fact, Mr. Gompers is quoted as saying that "there is no strike, but of course there is no law to prevent men from quitting work."

Mr. Gompers is usually forceful and very definite, and where the prestige of the American Federation of Labor is concerned, he has not hesitated at any time to state his views without qualification and in a way which was unmistakable. This makes his acceptance of an unauthorized or outlawed strike a most peculiar attitude, and one not at all consistent with his own policy in such matters.

All these items indicate that this strike is not merely a part of the regular unrest which is occurring or merely a demand for increased wages or a larger share in the rewards of industry. Neither can it be considered as a spontaneous outburst on the part of dissatisfied labor. While it has some elements in common with I. W. W. strikes, it is not customary for the I. W. W. leaders to operate strikes secretly or to refuse to acknowledge their leadership. In general, the leaders of that radical organization have been very definite in their public statements, and very willing to utter their disagreement with present industrial developments at any time. They have never made any secret about their desires, and usually they have fomented strikes by inducing utterly unreason-

able demands and not by starting a strike without any demands at all.

There is no doubt that the restlessness among railroad employees has been increasing. They have had a taste of power and they had no desire to see the roads returned to their private owners. There is no doubt that the recent developments in increased rents, etc., have placed some classes of railroad labor at a serious disadvantage, because these classes did not share in the general increases adopted for the Brotherhoods at various times during the war.

Furthermore, there is no doubt that the railroad conductors, locomotive engineers and similar employees are intelligent, shrewd types of labor, with plenty of ability to see the advantage and use it when it is in their hands. It is quite likely also that the reports are correct in stating that the initial trouble arose over the transfer of Grunau from one post to another, and that this was the immediate reason for the starting of the trouble.

When the President of the American Federation of Labor, who has been fighting to increase the power of that Federation and its membership views the breaking away of so many members of unions in unauthorized action with such a calm spirit of development, it does not look as though the Federation was seriously disturbed by this new evidence of "radicalism" within the ranks of the most powerful union organization in the country.

From time to time, in these articles, the statement has been made that the action of trade unions could not be divorced from the ambitions and desires of the leaders, and the circumstances surrounding this strike made it advisable to examine the known evidence as to the ambitions of the leaders of the Four Brotherhoods. Until just before the outbreak of the war in 1914, the railroad unions were counted among the most conservative. Their operations have been characterized by well-balanced consideration and by intelligence which could not be accorded to many other unions.

During the war and particularly after the Government took over the railroads, after the United States entered the conflict, railroad Brotherhoods began to show increasing signs of what is termed radicalism but what was really a shrewd desire to take advantage of the necessities of the case to consolidate their power and importance. On the eve of the conflict they engineered the Eight-Hour Bill.

After the roads were in Government control, they not only engineered further increases, but they were, of course, in a powerful place on account of the Government machinery for mediation. When it became apparent that some change in the situation was necessary after the armistice, they brought forward the Plumb Plan, which was adopted by the American Federation of Labor and which they undoubtedly hoped might be acceptable as a solution of the problem. Since that plan was turned down and since the failure of the first Industrial Conference, which was called with a large labor representation, the American Federation of Labor has publicly announced its intention of using its influence for the next election. Along with the Brotherhoods, it has denounced the bill, which has since become law, for the control of the railroads and has indicated that labor unrest was not to be cured in that way.

Under these circumstances, it would be unwise to estimate this strike as a sporadic outbreak of restlessness and as a purely outlaw attempt to divide the Brotherhoods, which have so far governed railroad labor affairs very completely and effectively.

The Immigrant To-day

SPEAKING before the National Conference on Immigration in New York recently, John E. Otterson, president of the Winchester Repeating Arms Co., and of the New Haven Chamber of Commerce, stated that before the war an average of 1,250,000 immigrants entered this country each year, and that since the war only one-fourth of this number have been coming over annually. He said also that five times as many have left this country since the signing of the armistice as had come in. Feeling that it was necessary to take effective steps to fill the unskilled labor gap, Mr. Otterson made several recommendations. They may be summed up as follows:

1. The National Government, in co-operation with American industry, should encourage and select immigrants.
2. Local agencies, such as chambers of commerce, civic associations, industrial leaders, etc., should take definite and effective steps to hold the immigrant once he has arrived.
3. They need chiefly human treatment; not Americanization of the "hymn singing" kind.
4. They should be taught English for the purpose of reducing the number of industrial accidents among foreigners, which is now twice as great as among native-born citizens; and so that they may understand what we say to them in every way.
5. Communities should render them service by protecting them from insults which often are offered by ignorant Americans and others who should know better, and by giving them educational, civic, legal and medical aid.

It is more important, the speaker said, that immigrants be made to understand and heartily receive our American ideals than that they be artificially hastened through the technical process of obtaining citizenship.

Petroleum Production Figures

IN a recent lecture before the Royal Institution, Sir John Cadman, Professor of Mining at Birmingham University, Birmingham, England, stated that the world's production of petroleum had risen from 38,000,000 tons in 1907 to 55,000,000 tons in 1914 and to 70,000,000 tons in 1918. To the latter figure the United States had contributed nearly 60,000,000 tons, the output of Europe being 5,500,000 tons, that of Asia 6,000,000 tons (mainly from Borneo, Burmah and also Persia); South America yielded 900,000 tons, and Africa perhaps 500,000 tons.

When the war broke out, the United Kingdom needed over 2,000,000 tons of oils of all kinds for various purposes, which had to be imported from the United States and from the East. The war demands for ship and omnibus propulsion, for lubrication, explosives, chemical manufacture, etc., rose steadily, and as up to 1917, each branch or section of oil users looked after its own interest, the position became so serious that the distribution was intrusted to one department under Mr. Walter Long.

In spite of all difficulties, oil imports into the United Kingdom—about 1,750,000 tons in 1912, and over 2,000,000 tons in 1917—increased to 5,500,000 tons in 1918; one of the main difficulties being to keep the available stock of oil below the danger line, so far as possible.

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Tendencies of the Day

AN unusual news item, for these days, was printed in a recent number of AUTOMOTIVE INDUSTRIES. It told of an agreement of workers and management of an Indiana company for a longer hour schedule. No reader needs be told that the tendency recently has been the other way. Fewer hours of work have been called for all along the line. Overtime, even at a premium, has been spurned. So this item telling of a different situation at one plant is as welcome as the first bird of spring after a winter of deep snows.

Coincident with the publication of this item, appeared the report of the Federal Reserve Board, telling of many indications that the consumer was beginning to retrench, and that priced goods were not selling as freely as had been the rule. The report also noted a change in the attitude of business men—a natural sequence of the attitude of the consumer. In summing up, the Reserve Board said: "Throughout practically all of the reports runs a recognition of the existence of an overstrained condition of credit and of some continued tendency toward speculative operations, while high living costs and the upward movement of prices have apparently not been checked, notwithstanding the decrease in prices of some classes of goods and a tendency toward restricted trade in specified lines."

The same week a weekly paper of one of the commercial agencies told of the failure of salesmen of high priced shoes to find customers. The shoe trade, it was stated, was good when measured by bulk but high priced footwear was not going to the dealers. They frankly were afraid to stock up on goods priced at figures so often seen in the show windows during the past winter.

Perhaps the tide is turning and perhaps you can help.

Drive Away on Railroad Tracks

SINCE the freight situation has become so bad that it is necessary to drive a large percentage of automobiles away under their own power, some better solution of the problem than driving these over the road should be considered. Were the roads of the country all concrete or macadam, the drive-away proposition would not be a bad one. But since it is necessary to drive the cars to all parts of the country, some with roads that are impassable at times, the possibility of utilizing the railroad tracks becomes of great interest.

It would be possible to make light, pressed steel flanged rims to slip on the wheel in place of the ordinary tire carrying rim, these flanges to fit the railroad tracks. The cars might be driven away in trains of three or four, in charge of a man who is familiar enough with railroad practice so as not to interfere with ordinary traffic.

If some such arrangement as this could be made, it would release thousands of freight cars needed for practically every manufacturing industry. It would be possible with the flanged railroad rim to reduce the number of drivers by 60 per cent, at least, and possibly by more. Furthermore, it would materially reduce the time necessary to drive the car to any particular destination. Where there are hard surfaced roads such as concrete, macadam or brick, this procedure would not be necessary. On the other hand, on some roads, in the South particularly, it appears to have advantages which should be carefully considered.

The investment in the flanged rims would not be high. They could be shipped back to the starting point and used over again indefinitely. During the winter when certain parts of the manufacturing districts are practically snow-bound as far as the roads are concerned, the railroad tracks are open. The freight situation is not one of a congestion of tracks so much as it is a congestion of terminals and a shortage of cars.

It is known that this plan has been tried out in an incomplete manner and that certain objections were found by the Interstate Commerce Commission. However, the matter should not rest at this if the

proposition appears to have any value at all, as the railway situation is so acute that every possible means of relief should be studied carefully.

Theory of Tractor Stability

SOME tractor engineers seem to persist in the belief that, when the front end of a tractor is raised from the ground, the pivotal axis is along the line of ground contact of the wheels and that the chief factor in causing the front end to raise up is the movement of the drawbar pull around this pivotal axis. The fallacy of this theory can be clearly demonstrated. Of course, it is possible to conceive of a tractor so arranged and so placed that a vertical line through its center of gravity falls back of the line of ground contact of the rear wheels, and the tractor then will topple over backward under the force of gravity if frame and wheels are locked, as by having the low gear in mesh, the clutch in and the engine dead. This, however, applies not only to a tractor, but to any freely supported object; that is, if a vertical line through the center of gravity falls outside the supporting base the object will fall over. The likelihood of such conditions occurring in tractor plowing is so remote that the case may be dismissed without further thought.

In order to raise the forward end of the tractor any appreciable distance from the ground, mechanical work must be done. There are only two sources of energy which can be drawn upon. One is the kinetic energy stored up in the moving tractor. If this comes into play the resulting force acts through the center of gravity of the machine and in the direction of travel, and such a force certainly does not tend to raise the front end.

The only other source of energy is the engine, and the engine can do work only if there is relative motion between the driving wheels and the frame. Work on energy is composed of two elements—force and distance—and without such relative motion one of these elements, distance, is lacking. In order that there may be relative motion between wheels and frame, either the wheels must roll forward over the ground—in which case there can be no question of the tractor rearing around the line of ground contact—or the frame must be turning backward around the wheel axis. It is this latter action that actually takes place. If the drawbar extends beneath the driving axle, as is usually the case, the drawbar pull tends to prevent the front end from raising up, and it is a fact that some of the authenticated somersaults of tractors occurred when no load was being pulled.

CONGRESS has heard the cry of economy and has attempted to heed it. But a lack of business knowledge has hampered the first attempt, that of cutting off appropriations for foreign trade investigations. Business spoke promptly and firmly and this excellent branch of service will continue. At the same time business will speak promptly and firmly in favor of cutting off useless employees.

The Functions of Employee Service Work

IF the evil results of ill-conceived and poorly operated "welfare" work accrued to no one except organizations which instituted it, its failure would be of little interest to any one outside of that particular organization. Unfortunately, however, this is not the case. Only the fact of the welfare work itself, together with the results which it produces, is known outside the plant; thus, a failure of one employee service or welfare plan, due possibly to the spirit in which it was conceived and the method in which it was carried out, becomes a current argument outside of the plant against such plans and such work in general. The real reason for the failure is neither understood nor investigated.

When one plant institutes welfare work as a substitute for just piece rates reasonably maintained, or for fair wages and hours, failure is not attributed to this fact but to the uselessness of such work in general. When asked recently why his plant had been able to obtain a low turnover; why it had been comparatively free from labor trouble in general, the production manager of a large Detroit automobile concern said:

"We treat our men squarely; we work a 48-hour week, maintain piece rates and treat our men as we would expect to be treated if we were in their place. We do not do any welfare work, however. That square treatment may be the reason our labor policy is a success. But here is the Blank plant across the way. They treat their men fairly and do all kinds of welfare work. Still they have strikes, labor troubles and a high turnover. So it is hard to say why we have not had trouble. It is hard to attribute it to any one thing."

A subsequent investigation of the Blank plant, however, showed not only that there was totally inefficient organization of the personnel department, but the practice of cutting piece rates was a current one, and that the plant worked in two shifts, one of 11 hr. and one of 12 hr. daily. The Blank plant, in brief, was attempting to use employee service work as a substitute for something else. The work was, of course, a failure.

The more competent employment managers of the automobile plants believe in general in the efficacy of employee service work if it is used as an addition to a constructive policy, but they are almost a unit in declaring that the work will be unsuccessful if an attempt is made to use it as a substitute for other necessary things.

In the case of the Blank plant, as in some others, failure of the employee service work was being attributed by outsiders to the uselessness of the work itself. The real reason for the failure lay elsewhere—in the fundamental incorrectness of the company's policy toward its workmen.

The employer, using wrong personnel methods is a menace to good industrial relations, not only in his own plant but in all the plants of his vicinity. Charity does not cover a multitude of sins.

Production Extends Despite Handicaps

N. A. C. C. Sees Little Hope of Relief from Freight Congestion This Year

NEW YORK, April 10—Though transportation conditions are worse than at any time in the history of the automobile industry, tremendous increases in production are reported. At a meeting of National Automobile Chamber of Commerce directors this week, it was shown that shipments for March would approximate 28,000 carloads, compared with 23,744 carloads in March, 1919. In addition to this, 46,000 cars, or about 13,000 carloads, were driven away from the factories during March.

Shipments for January and February of this year totalled 46,812 carloads, compared with 36,191 in the same period last year. In these two months of 1920 the drive-aways from factories numbered 57,482 machines of an added 16,500 carloads. One Ohio manufacturer reported that he had driven away 600 cars in one day last month, while one from Detroit reported a drive-away of 500 in one day.

It was pointed out that there are in the country only 90,000 automobile freight cars, and that a third of these are owned by the New York Central lines. Now that railroads have gone back to private control it is difficult to get wide distribution of these cars. The directors of the N. A. C. C. believe manufacturers might as well make up their minds that it will be necessary for them to drive away from their factories a large part of their product all this year.

Considerable improvement in the transportation situation has been brought about through the activities of the traffic committee of the Chamber, which has brought pressure to bear on the railroads to expedite automotive shipments. In this respect the automotive industry is in much better position than others, because it is not absolutely dependent on the railroads.

Would Sell Manufacturers Bonds

One interesting announcement at the meeting was that a large railroad has approached automobile manufacturers with the proposal that they buy its 6 per cent certificates with the understanding that the proceeds of the sale would be used for the purchase of automobile cars. The N. A. C. C. has been asked to lend its influence to the project, but the subject was referred to the traffic committee.

The directors sanctioned plans which have been made to interpose the most strenuous objections to the proposed increase in freight rates to the Pacific Coast, which would result in an increase of from $150 to $200 a carload on shipments of passenger cars, and from $250 to $400 on trucks. Traffic experts have been retained to assist in combating the proposed rates. The Motor Car Dealers Association of San Francisco has offered its co-operation, and Pacific Coast dealers are greatly incensed over the rates proposed.

The directors authorized the holding of a service managers' convention at Indianapolis the last of May. The recently organized service division, headed by H. R. Cobleigh, has called a meeting at Detroit for April 14 to map out a plan of campaign.

A representative of the Chamber will be sent to the meeting of the National Industrial Conference Board at Chicago, at which revision of Federal taxation will be considered.

Resolutions of respect were adopted on the death of Elmer Apperson, one of the oldest members of the organization.

Convention to Discuss Gear Standardization

DETROIT, April 10—Standardization in the manufacture of gears is one of the important subjects to be discussed at the fourth annual meeting of the American Gear Manufacturers Association, which will be held here April 29, 30 and May 1. An entire day of the convention will be devoted to the various angles of this subject and reports will be given by committees which have had it under consideration for months.

An interesting program has been arranged which will include papers on such subjects as "Gears from a Purchaser's Standpoint," by D. G. Stanbrough, of the Packard Motor Car Co.; "Routing of Gears and Machine Parts Through the Factory," by J. A. Urquhart, of the Brown & Sharpe Mfg. Co.; "The Science of Manufacturing," by Henry M. Leland, president of Lincoln Motors Co.; "Problems of the Gear User," "Mill Gearing from the User's Standpoint" and other phases of gear manufacturing.

AIRCRAFT OFFICIAL RESIGNS

NEW YORK, April 10—Holt Thomas, chairman of the Aircraft Mfg. Co. of England, according to information received here, has resigned his chairmanship of the concern, the future of which, as an aviation company at least, is more or less clouded. The company recently was absorbed by the Birmingham Small Arms, Ltd., which, according to a statement made by Thomas, may intend to devote the Aircraft company works to the building of automobile bodies and similar engineering work. The Aircraft company is known by the name of Airco and now operates an aerial express and passenger line between London and Paris on regular schedule.

FORD STARTS BLAST FURNACES

DETROIT, April 10—Blast furnace operations at the Ford River Rouge Plant was begun this week. Henry Ford, Jr., grandson of Henry Ford, officiated at the ceremony, lighting furnace "A." The full limit of 500 tons of metal daily is expected to be reached within a short time.

New Franklin Truck Nears Completion

Embodies Air-cooled Features of Passenger Car—First Deliveries in May

SYRACUSE, N. Y., April 10—The first air-cooled pneumatic-tired truck will be an accomplished fact within a few weeks, according to James L. Yarian, chief engineer for the motor truck department of the H. H. Franklin Mfg. Co., who states that the designs for the new 1-ton model are 95 per cent complete.

Many of the features of the Franklin car are embodied in the truck, including besides the air-cooling system the wooden frame. High-speed transportation is the idea back of the design. The engine is a 4-cylinder type with large bearing surfaces lubricated by pressure. The transmission is a unit with the engine, and has 3 speeds forward and 1 reverse. It is small and compact, but of stout construction.

The front axle is the built-up Franklin type and is of heat treated nickel steel. The weight of the rear axle is but 175 lb. Helical bevel gears are used for the final drive. The differential is of the locking type, made to take care of ruts, mud, ice and snow. There are no grease cups on the chassis, and all spring and axle pins are lubricated by wicks from oil reservoirs designed for refilling only every 3000 to 5000 miles.

A variety of bodies to meet all classes of work will be made to order. Weatherproofing the driver's seat is a feature, as is also the provision of electric lighting and starting systems.

F. W. D. DEVELOPS FIRE TRUCK

CLINTONVILLE, WIS., April 12—Announcement is made of the development of a new 3-ton fire truck by the Four Wheel Drive Auto Company. The new apparatus contains an unusually powerful special type J Wisconsin motor, with a 5.1 in. bore and a 5.5 in. stroke, developing 42 hp., S. A. E. The type B rotary pump, driven through a two-speed transmission, has a capacity of 500 gal. at 120 lb. pressure.

JONES TO RESUME PRODUCTION

WICHITA, KAN., April 9—Completion of the new factory buildings of the Jones Motor Car Co. is expected by May 10. Normal production will be resumed at that time. Though handicapped by the fire damage of February and an increase in prices of $500 a car, the company reported record business for March.

BRITISH COLUMBIA PLANS ROADS

VICTORIA, B. C., April 10—Announcement was made, March 30, by the Provincial Minister of Public Works, that approximately $8,000,000 will be expended on highways in the province during the next three to four years.

Timken Gets Listing on Detroit Market

Outstanding Common and Preferred Stock Offered—To Reduce Par on Common

DETROIT, April 10—Timken-Detroit Axle Co. has been listed on the local stock exchange, the application having received unanimous approval of the board of governors. The listing will be of the corporation's outstanding issue of $3,000,000 common of the par value of $100 and $5,000,000 of 7 per cent cumulative preferred.

The financial statement accompanying the application shows assets of $22,697,213, with a surplus at the end of 1919 of $10,175,519. The company's authorized common stock is now $30,000,000 and preferred $15,000,000. This, taken in connection with the surplus, gives grounds for the reports in financial circles of a proposed stock dividend. The common soon is to be reduced to $10. Another item of unusual significance is the fact that goodwill, patents, etc., are listed in the company's report at only $1.

An appropriation of several million dollars to provide for additional buildings, equipment and machinery to provide for a 50 per cent increase in output for 1921 has been made and part of the additions have been built or are in course of construction. The company proposes to produce in its own factories more of the material going into its finished product, assuring its customers greater efficiency in the operation of its product.

Development of the corporation is reflected by its dividend records since the organization in 1909. Beginning with 1910, up to and including the first two months of 1920, the company distributed common stock dividends totaling $7,437,957.50. This was in cash, with the exception of a 200 per cent stock dividend in 1914. During the same period $599,836.75 in interest was paid on preferred.

Timken Roller Bearing Co., one of its chief supply sources, now is operating two separate factories, insuring uninterrupted production of axles in case of accident at one plant.

SIMMS MOTORS TO BUILD CAR

ATLANTA, April 10.—The Simms Motor Car Corp. has been organized with a capital of $2,500,000 and announces that it proposes to erect a factory here at a cost of $250,000. The company, which is headed by Thomas H. Mars, proposes to manufacture a popular priced car and the initial production is expected to be about 25 a day, Mars says.

M.-P. TO DISCONTINUE TRUCK

NEW YORK, April 12—Stockholders of the Martin-Parry Corp. are expected to ratify a proposal to sell the company's truck business to a new corporation. The chief business of the company is the building of automobile bodies but so many orders for Atlas trucks have been received of late that President Watson feels the operation should be segregated.

It is expected that a company, known as the Atlas Truck Co., will be formed with 100,000 shares of no par value stock to take over the truck business. It will pay Martin-Parry about $250,000 in cash for materials, etc., and a block of stock. This stock, it is intended, will be distributed to Martin-Parry holders who will also be given an opportunity to subscribe to additional shares of Atlas Truck stock. In all about 60,000 shares of the truck company's stock is to be issued and the amount offered for subscription will be underwritten.

To Build Front Drive

G. J. Hoskins, of New South Wales, and his sons, L. P. Hoskins and E. J. Hoskins, are at present in this country to develop a front drive for automobiles, the invention of the elder Hoskins. An experimental car is being built at Los Angeles.

De Palma to Drive Ballot in Sweepstakes

INDIANAPOLIS, April 10—Ralph De Palma has signed to drive a Ballot in the eighth annual 500-mile race to be held at the Indianapolis Speedway May 31. His team mates in the big race are not announced, nor are any details of his car except that it will be of 180 cu. in. piston displacement, 3 cu. in. inside the limit specified, and that it will be a 1920 model.

Last year De Palma drove a 12-cylinder Packard and, despite persistent engine and tire trouble, finished sixth. This year he is riding a Ballot—"because he wanted something distinctive," as he expressed it.

G. M. C. TRUCK PRICES RISE

NEW YORK, April 12—General Motors announces the following increases in the prices of its trucks:

	New Price	Old Price
1 ton truck	$1,725	$1,559
1½ ton truck	2,650	2,500
2 ton truck	3,100	2,950
3½ ton truck	4,150	3,950
5 ton truck	4,750	4,550

FRANCE BUYS CZECHO PLOWS

NEW YORK, April 12—Reports from Paris say that Laurin and Klement, the largest automobile concern in Czechoslovakia, received an order from France, amounting to 1,000,000 francs, for Laurin and Klement "Excelsior" motor plows. These plows entered competition with 75 other types manufactured in other countries during tests held in Senlis, France, last September and proved highly adaptable for usage in French agricultural work.

Future Fuel Supply in Oil Bearing Shale

Secor, Consulting Engineer, Tells Chicago S.A.E. of Possible Developments

CHICAGO, April 10—"Through proper development the large deposits of oil bearing shale can be made a practically invulnerable bulwark of oil supply and this development will of necessity have to take place should the price of fuel and its output continue to diminish as rapidly as it is doing now," was the statement of John Secor, consulting engineer of the Advance Rumely Company, at a meeting of the Midwest Section of the Society of Automotive Engineers last night.

Mr. Secor addressed the society on the subject of kerosene as a tractor fuel and diverted just enough to give those present a slight conception of what was in store for the future generations should the supply of petroleum fuel become exhausted. D. Stockfleth and N. G. Anderson, truck engineers of the International Harvester Co., presented a joint paper on "Truck Maintenance," together with a series of questions which had a bearing on the subject of truck design as it affected service.

There was an interesting discussion on Mr. Secor's paper. President Horning of the Waukesha Motor Company, Waukesha, Wis., talked about the fuel problem as it affected the design of the combustion chamber. He said in a half serious and partly humorous way that they had just found out that one factor which governed the successful burning of kerosene fuel was that any surface within the combustion chamber must not be parallel to its opposite surface.

Time limited the discussion on the paper on truck maintenance. L. W. Pietsch of the Standard Oil Company, responsible for the maintenance of 5800 trucks and 6000 passenger cars throughout the United States, said he hoped to see the day when, in the event of an engine breakdown on the road, the factory service branch could meet the truck and slip in a new engine. Pietsch said that this could easily be brought about by placing the engine on skids, so that by undoing a few thumb screws the radiator core could be lifted out and the engine slipped out through the shell.

Pietsch characterized as rediculous a design where a high pressure tire pump, for truck pneumatics, located on the transmission could be gotten at only by lifting up the seat and the floor boards should it happen that the air line should blow off from the pump.

PRESENT ADVERTISING BILL

INDIANAPOLIS, April 12—A plan for a Federal Department of Advertising, presented in the form of a proposed bill creating it, will be offered at the convention of the Associated Advertising Clubs here, June 6 to 10, the program committee announces.

Maxwell-Chalmers Merger Nears Close

Rumor that Hupp Is to Be Included in Deal Lacks Confirmation

NEW YORK, April 12—Final consolidation of the Maxwell and Chalmers interests may be expected by May 1, it was said to-day at the offices of J. S. Bache & Co. It will be preceded by an optimistic financial statement by W. Ledyard Mitchell, president of the Maxwell Co. Little remains to be done to complete the merger.

The Chalmers Motor Corp. voted on Sept. 10, 1917, to adjust its capitalization and lease its plant for five years to the Maxwell Motors Co. A merger with the Maxwell interests was proposed in October, 1919. Jules S. Bache, J. Horace Harding and Hugh Chalmers were appointed a committee to act with James C. Brady, John R. Morron and Elton Parks, representing the Maxwell Co., to work out the details of consolidation.

Negotiations were begun with the Board of Governors of the Stock Exchange and permission was granted to list on the Exchange $969,000 worth of first preferred stock, $3,215,000 of second preferred and $250,000 of common. No change is probable in this allotment of stock but no announcement has been made as to what will be given the present stockholders of the two companies. The new corporation will be known as the Maxwell Motors Co, Inc., or the Maxwell-Chalmers Motor Corp. The present Maxwell organization was built up out of the wreck of the old United States Motors Co.

Reports have been current that the Hupp Motor Car Corp. might be included in the Maxwell-Chalmers consolidation but they apparently are without foundation. The banking interests which represent the company in New York said to-day they had no knowledge whatever of such a plan. It was stated, however, that they did not know the interests responsible for the tremendous volume of trading in Hupp stock in the past few days. There is a large amount of Hupp stock in the open market and it has not yet been determined whether an attempt is being made to buy a controlling interest. No formal amalgamation negotiations are under way, however.

Many Mergers Rumored Near

Wall Street has been filled of late with rumors of impending automobile consolidations but they appear to be more or less ephemeral. Some of them have to do with additional purchases by General Motors and others with another tremendously larger merger. No firm foundation can be found for any of them.

The end of the flurry caused by the corner in Stutz stock is not yet in sight. Allan A. Ryan is standing pat and the short interests have retained attorneys to represent them in legal proceedings, which appear imminent. The business conduct committee of the Stock Exchange has announced that it proposes to investigate the long and short interests in Stromberg Carburetor, another of the so-called Ryan stocks. It has risen rapidly of late but there is no intimation that ruling it off the exchange is contemplated.

Ryan recently was re-elected a director of the Bethlehem Steel Corp., which would seem to dispose effectually of reports that he had had a disagreement with Charles M. Schwab. Both men are heavily interested in Vanadium Steel, which has been taking on new values in the market of late.

British Manufacturers Study Production Here

NEW YORK, April 12.—In the expectation of gaining much valuable information concerning American production methods, a party of English and Scotch manufacturers have arrived here to make a tour of large American factories. They are particularly interested in standardized daily and quantity production as well as economies which have been effected on this side of the Atlantic.

The party includes Samuel Mechan, managing director, and J. Y. Moyes, factory superintendent, of Mechans Ltd., Glasgow, manufacturers of steel frames and sheet steel; Arthur Green, managing director, of the Coventry Repetition Co., Coventry, manufacturers of automatic machinery and small parts; F. W. Witherell and A. W. Hubble of the Willys-Overland-Crossley, Ltd., of Manchester, and J. R. Garner, managing director of Lancaster Ordinance Accessories Co., Ltd., manufacturers of forgings.

PREST-O-LITE TO BUILD HOMES

INDIANAPOLIS, April 10.—To obtain sufficient housing for its employees the Prest-O-Lite Co., located in Speedway City, west of Indianapolis, is planning to build industrial homes, a new hotel and a community center. Labor turnover has brought the Prest-O-Lite executives to a realization that they must go into the home-building business to meet business demands.

The Prest-O-Lite Co. expects to double its capacity by July 1. Plant improvements costing $500,000 are nearing completion. One of these is a big foundry. Other buildings for handling the battery business of the company are under construction. Several of the old buildings are being remodeled and several re-equipped.

KNOX TIRE PLANT PROGRESSES

MT. VERNON, OHIO, April 12—Factory construction for the Knox Tire & Rubber Co., near this city, is progressing slowly. The structure will be 225 x 125 ft., three stories and basement. It will be of steel, brick and concrete construction, and will cost $170,000. The company has purchased a complete line of tire making machinery. It is expected to have the plant ready for operation by July 1 at the very latest.

Acason Brings Out New Truck Models

Series Will Carry Changes in Assembly—New Prices Go Into Effect

DETROIT, April 10—The Acason Motor Truck Co. has brought out a new series of assembled models of 1, 1½, 2½, 3½, and 5-ton capacities. In connection with a number of changes in the make of component parts, a new price list goes into effect with the appearance of the new trucks. These trucks include the new Waukesha engine, Timken axles, Eisemann magneto with impulse starter and Marvel carbureter. The gearset is a Cotta, mounted amidship, and the propeller shaft and universal are the product of Blood Brothers. The steering gear is Ross and lubrication is by the Alemite system.

The 5-ton model has an engine rated at 60 hp., 5-in. bore and 6¼-in. stroke. It is governed for a road speed of 14 m.p.h., and has a low gear reduction of 55 to 1, standard, and 60 to 1, optional. The wheelbase on the standard chassis is 187 in., and on the dump chassis, 172 in. Tire equipment is solid, on Smith steel wheels, 36 by 6 in. front and 40 by 6 in. dual rear. The list price is $5,850. Giant pneumatics, 40 by 12 in., can also be furnished for the rear.

Following are the chief specifications of the other models:

Three and one-half tons: engine, 4½ by 6¼ in.; wheelbase, 187 in.; price, $4,900.

Two and one-half tons: engine, 4⅜ by 5¾ in.; wheelbase, 150 in.; tire equipment, 36 by 4, single, front, 36 by 8, single, or 4 in. duals rear. List price $3,850.

One and one-half tons: engine, 3¾ by 5¼ in., four-speed gearset and governed for a road speed of 18 m.p.h. The list price is $2,650.

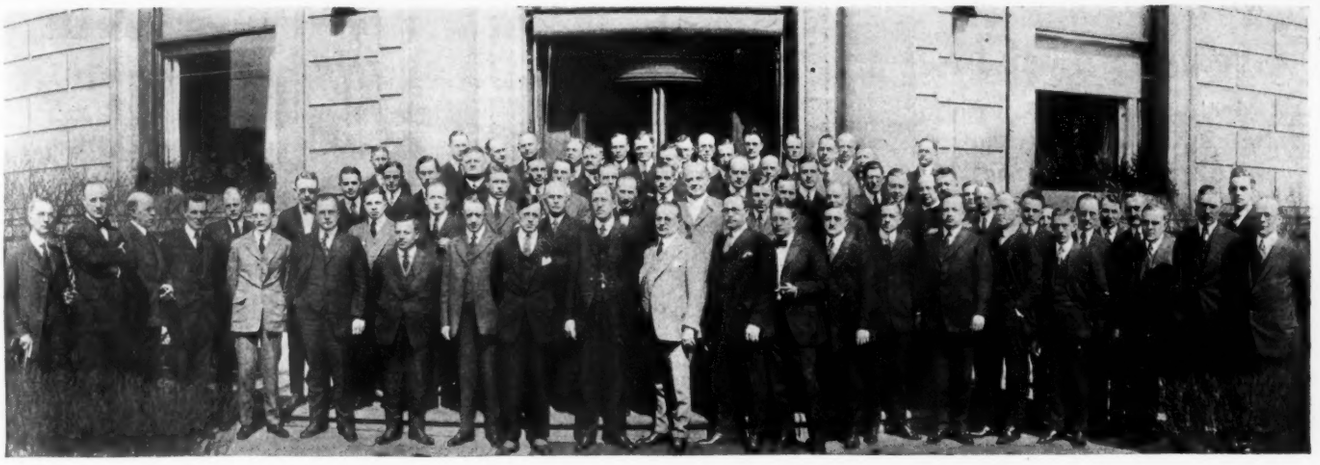
The 1-ton model is rated at 38 hp., also, with the same engine as the 1½-ton, but with three-speed gearset. It has a governed road speed of 20 m.p.h., and is listed at $2,400.

SIMPLEX BODY TO MOVE PLANT

PHILADELPHIA, April 12—The Simplex Manufacturing Co., Conneautville, Pa., manufacturer of motor truck bodies, J. J. Hewit, superintendent, has leased for five years the building at Mercer, Pa., formerly occupied by the Reznor Manufacturing Co. It will establish its factory there.

SPARKS-WITHINGTON BUILDS

JACKSON, MICH., April 10—Construction work on a four-story building for the Sparks-Withington Co. is under way, and improvements to the plant, known as unit No. 2, also are being made. A second story, 50 x 320 ft., is being added to the main factory building.



Truck Builders at the Timken Convention in Detroit

Officials of all companies using Timken axles gathered at the Detroit Athletic Club recently to discuss new phases of commercial vehicle building. The convention agreed that the present system of rating trucks was the only practicable method of defining the weights they should carry

Imports Far Exceed British Car Exports

Tires Only Part Showing Approximate Trade Balance—Tractor Exports, $50,000

LONDON, March 23. (*Special Correspondence*)—In February Great Britain exported 169 vehicles, and 77 vehicle chassis, having a combined value of $877,360 (pre-war rate of exchange). The export of chassis parts had a value of $659,480. Tractors appear for the first time separated in the list of exports. The value of these exports was $50,000 and of tires of all kinds, $2,225,495.

The corresponding motor imports for February were as follows: Number of vehicles 2,482, chassis, 898, of the combined value of $5,969,930. Parts valued at $3,405,450. Tractors valued at $190,995 and tires of all kinds $2,482,555. These figures show the little headway the British export motor vehicle industry so far has made, and correspondingly that Great Britain is importing at the *rate of* 40,500 chassis yearly.

The British export of motorcycles and parts during February had a value of $533,650 and the corresponding import value was $127,610.

STUTZ COMPLETES ADDITIONS

NEW YORK, April 12—Stutz Motor Car Co. will have completed by summer additions to its plant which will provide facilities for turning out 7,500 cars a year. Production for 1920 is estimated at 5,500 cars.

AVERY ADDS TEXAS BRANCHES

SAN ANTONIO, TEX., April 10.—According to J. B. Bartholomew, president of the Avery Co., Peoria, Ill., the demand for farm machinery and implements in Texas is greater than ever before. Bartholomew has been making a tour of Texas, visiting branch houses of the company. He says that two new and large branches are to be established at Amarillo and San Antonio.

According to Bartholomew, the branch house in San Antonio will be large enough to handle the requirements for southern Texas and also all of the export business in Mexico. At the present time the company has a branch in Dallas, which takes care of the business in the northern part of the state, but because of the immense area covered by Texas, two branches are deemed advisable. At the present time the Avery company is represented in San Antonio by the Alamo Iron Works.

Nash Motors Sued for Commission on Trucks

MILWAUKEE, April 10—Chipman, Ltd., London, England, filed suit in the Circuit Court at Milwaukee against the Thomas B. Jeffery Co. and the Nash Motors Co., Kenosha, Wis., to recover $880,000 alleged to be due as commission on motor car and truck sales. The complaint avers that it entered into a contract with the Jeffery company on Jan. 23, 1914, under which it was to have the sole right to sell Jeffery products and parts in Europe, England, Australia, South America, Mexico and other nations. The Nash company is a party since it took over the business of the Jeffery company after the contract was made. It is charged that the defendant violated the agreement and sold trucks to the Russian, English and French governments between Nov. 16, 1914 and July 31, 1915, to the value of $4,000,000.

GARFORD SERVICE AT BRIDGE

NEW YORK, April 12—The Garford Motor Truck Co. is completing plans for the erection of a 12-story service and repair building to occupy the entire block front on the Bridge Plaza, Long Island City.

Truck Show Problem in Committee Hands

N. A. C. C. Assigns Members to Study Situation and Suggest Demonstration Means

NEW YORK, April 10—George M. Graham, general sales manager of the Pierce-Arrow Motor Car Co., and R. H. Salmonder, vice-president and general manager of the Selden Truck Co., have been appointed a committee of the National Automobile Chamber of Commerce to investigate all phases of the motor truck show question.

A majority of the committee appears to be strongly in favor of holding shows, but expositions of the action type, separate from displays of passenger cars as in the past. It is felt that motor trucks should convey the idea of transportation to the last degree and that this cannot be done unless they are shown in action.

While Graham has an open mind on the subject, he is at present in favor of shows held under cover and believes buildings of adequate size to house them should be found. He would have seats provided for spectators where they could sit and watch trucks put through their paces, showing just what could be accomplished in loading and unloading as well as their manifold uses.

The committee also will take up the number of shows which should be held and their locations. One of the first steps to be taken will be to get in contact with the Motor Truck Sales Managers Association.

EXPORTERS TO MOVE

NEW YORK, April 10—The J. B. Crockett Co., automotive exporters, will move from the present location at 44 Whitehall Street to 15-17 East Forty-ninth Street, May 1.

Oil Producers Seek Greater Power Fuel

First Meeting to Discuss Gasoline Situation Dispels Rumors of Abnormal Advances

NEW YORK, April 10—As a preliminary to co-operative efforts which it is hoped will result in a solution of the gasoline problem, representatives of the National Automobile Chamber of Commerce, the Society of Automotive Engineers and the American Petroleum Institute met this week for conference.

Much research work and investigation remain to be done before any conclusions can be reached. The first meeting was given over to a general discussion of the situation from the viewpoints of those who use gasoline and those who produce it. Both interests decried sensational reports that "50-cent gas" is imminent. Such stories have no basis in fact, it was asserted, and the sole result is an incentive to profiteering.

The petroleum men explained that crude oil is the basis upon which prices of gasoline, kerosene and all the other by-products are based. One problem is the larger use of crude oil resulting from the steady increase in oil burning machinery.

Stocks of gasoline are lowest in October after the summer months when touring is at its height, and largest in January when fewest motor vehicles are in operation.

Representatives of the oil producers disclosed the fact that they are now engaged in research work which they hope will result in the finding of some formula which will give greater power and a greater proportion of gasoline production from a gallon of crude oil. They declined to tell in detail what these experiments were.

Those who attended the meeting were: W. H. Isom of the Sinclair Refining Co., R. D. Leonard of the Atlantic Refining Co., and J. L. Smith, secretary of the American Petroleum Institute; Alvan Macauley, president of the Packard Co., Windsor T. White, president of the White Co.; H. H. Rice, vice-president of General Motors, and Alfred Reeves, general manager of the N. A. C. C.; H. L. Horning, Coker Clarkson, and Mr. Hill of the S. A. E.

LABOR STATISTICS

WASHINGTON, April 10 — Statistics regarding employment in automobile establishments in December, 1918, and December, 1919, have been made public by the Department of Labor.

The comparison of employment in identical establishments in December, 1918 and 1919, shows that in 39 automobile establishments there were 101.729 on the pay roll in 1918, and 129,075 in 1919, or an increase of 26.8 per cent. In 1915 the pay roll was $2,723,904, as against $3,946.728, an increase for the later period of 44.9 per cent. The percentage of increase in the number on the pay roll is greater in the case of the automobile industry than in any of the other twelve industries surveyed, while the percentage of increase in the pay roll is greatest in the mens' ready-made clothing, which increased 96 per cent, with woolens second with 58 per cent. The comparatively small number of employees in these two groups has much to do with the percentages.

The comparison of employment in November and December, 1919, shows that out of the 44 manufacturers reporting, a total of 133,704 employees were on the pay roll in November and 130,351 in December, or a loss of 2.5 per cent. The pay roll in November was $4,207,402, as against $3,975,884 in December, or a decrease of 5.5 per cent.

Renault Tanks to Aid Mountain Climbers

NEW YORK, April 10—Visitors to the White Mountains the coming summer will be able to climb to more or less dizzy heights seated on the back of a baby tank, according to an announcement of the Renault Co. From the tank it will be possible to view mountain scenery which would be inaccessible without the exertion of toiling up rock strewn cliffs. The use of baby tanks for this purpose was begun in Switzerland a year ago. The Renault factory is turning out highly mobile machines which "can climb like cats" with their creeping tread and low center of gravity, over rough, broken country and through woods.

MOTOR WHEEL OUTPUT GROWS

MILWAUKEE, April 10—The Briggs & Stratton Co., Milwaukee, has completed additions affording 100,000 additional feet of floor space, which will be devoted largely to the production of the Briggs & Stratton motor wheel. Since April 1 the production has been increased from 75 a day to 100, and by May 1 it is hoped to reach an output of 200, so that a schedule of 28,000 wheels for 1920 may be accomplished. The device originally was designed and manufactured by the A. O. Smith Corp., Milwaukee, which sold the exclusive patents and rights to the Briggs & Stratton Co. about a year ago. It embraces a motorcycle type of gas engine for attachment to the ordinary bicycle, or use in a buckboard type of miniature motor car for sport.

BRITISH SEEK ITALIAN TRADE

LONDON, March 23 (*Special Correspondence*)—The attention of the British motor trade has been called to the scope and market in Italy for a light car of about 10 hp. The Italian trade does not cater to this class of vehicle, and it is believed that the introduction of a few samples—listed as chassis, as complete cars are debarred—would find ready market in certain of the larger Italian cities and towns.

All-Weather Plant Under New Control

Production of Cleveland Company to Be Tripled Under Reorganization Move

CLEVELAND, April 10—The manufacture of automobile tops is to be greatly enlarged in this city by the All-Weather Top & Body Co., which has been organized and has taken over the plant of the All-Weather Top Co., 6545 Carnegie Avenue.

The company has an initial capitalization of $500,000 of preferred stock and 10,000 shares of no par common. All the patents, trade rights and business of the old company have been acquired, and arrangements made for tripling the capacity by building additions.

Organizers of the corporation are all well known in Cleveland automobile circles. Joseph W. Hayes, president and general manager of the new company, formerly was with the Fisher Body Co. of Detroit; Harry W. Anderson, general sales manager of the Templar Motors Corp., is vice-president; Fred H. Caley, secretary of the Cleveland Automobile Club, treasurer; C. E. Mellen, of Orgill, Maschke & Mellen, secretary, and A. R. Davis, of the Davis-Kenny Motor Co., a director.

Manufacture of an improved type of automobile top is now under way and production of automobile bodies will be started as soon as space is available, according to Hayes.

MARTIN TRIPLES FOUNDRY

MILWAUKEE, April 10 — The A. E. Martin Foundry & Machine Co., 705 Park Street, Milwaukee, a large maker of cylinder and piston castings for the automotive industries, is erecting additions which will increase its capacity about 300 per cent. A new cupola with a daily capacity of 50 to 60 tons will be installed. The plant was doubled in size last summer and fall. Motor manufacturers in all parts of the United States, Canada and England have provided a relatively enormous volume of business which will keep the plant busy for more than a year.

DOELGER ADDS MACHINE SHOP

MILWAUKEE, April 10—The Doelger & Kirsten Co., Milwaukee, manufacturing metal cut-off tools and other metal-working tools, has started work on the erection of a new machine shop, 90 x 210 ft. The investment will be about $100,000 in building and equipment. It is to be ready about June 1.

PACKARD BUYS BROOKLYN SITE

NEW YORK, April 10—Packard Motor Car Co. has purchased the block front on Bedford Avenue, between Sullivan and Malbone streets, Brooklyn, with a frontage of 200 ft. on Bedford Avenue, and will erect a three-story ornamental building to be devoted to showrooms and sales departments.

High Speed Camera Shows Truck Action

Metropolitan Section of S.A.E. Has Opportunity to Test Mathematical Conclusions

NEW YORK, April 9—Mathematical calculations as to what happens to a motor truck or its load under given traveling conditions were somewhat upset by the high speed camera last night at a meeting of the Metropolitan Section of the Society of Automotive Engineers in the Automobile Club.

The subject assigned to the meeting was "Tire Deflection and Unsprung Weight in Trucks." The speakers, A. F. Masury, chief engineer of the International Motor Co., and Capt. L. C. Josephs, Jr., also of International, used the camera to illustrate points in their talks.

Many of the engineers for the first time were able to visualize, by these means, the actual results of heavy jars and vibrations. In a number of instances the results were far different than mathematics had indicated. Trucks equipped with both solids and pneumatics were shown under similar traveling conditions.

The meeting and the dinner which preceded it. was attended by 200 members. Discussion followed the addresses. On April 30 the same talk will be given before the Detroit Section by M. C. Horine, of International.

SPAULDING ADDS TO PLANT

NEWARK, N. J., April 10—The Spaulding Chain Corp. has taken over additional buildings formerly occupied by the International Arms & Fuse Works. This expansion quadruples the size of the original Spaulding factory and provides for increased production. With this addition the Spaulding plant becomes one of the largest of its kind in the country. The full quota of production scheduled for the month of February was attained, and the event was marked by a general celebration.

FOX MOTORS BUYS PLANT SITE

PHILADELPHIA, April 12—The Fox Motor Car Co. has purchased a site for a steel and concrete factory, three stories high, on the main line of the Philadelphia & Reading Railway, above Tabor Junction. Plans are being prepared by the company's own engineers which call for a building 80 x 400 ft., to cost approximately $850,000. Other units of construction will follow. The plant, it is announced, will have an output of 2000 cars for the first year.

CLIMAX RUBBER TO BUILD

COLUMBUS, OHIO, April 12—The Climax Rubber Co. will soon start the erection of a large tire and tube plant on West Goodale Street, on a tract of 20 acres recently purchased. Plans for the structure which will be about 200 feet square and three stories high, are being prepared by Architect N. F. Blair of Cleveland. Equipment will be installed providing for a capacity of 2500 tubes and 1000 tires as the first unit. It is expected to have the plant ready for operation by October 1. Irving S. Hoffmann is president; H. A. Longshore, vice-president; M. E. Swanson, secretary-treasurer; C. B. Turner, assistant secretary-treasurer, and R. S. Fletcher, sales manager. The company has a plant in operation at Huntington, W. Va.

Tire Price Comparison

NEW YORK, April 12—Comparison of new prices on some of the leading tires in the 34 x 4 size, with the former scale on the same size, are shown in the following table:

Tire	N.S. Fabric Old	N.S. Fabric New	N.S. Cord Old	N.S. Cord New
Ajax	32.20	38.95	52.30	61.00
Firestone	34.10	40.10	50.65	59.60
Fisk	32.70	40.00	49.45	59.45
Goodrich	31.85	39.60	49.50	59.25
Goodyear	34.10	40.10	50.65	59.60
Kelly-Springfield	44.85	52.75	59.60	68.50
Lee	33.20	40.10	50.65	59.60
Mason	39.70	43.65	53.35	60.00
Mohawk	42.40	49.90	61.55	70.35
McGraw	37.35	44.10	50.65	65.55
United States	37.15	43.30	49.70	59.80

Bosch Production Increases 440 Per Cent

SPRINGFIELD, MASS., April 12—An increase of 440 per cent in production for March over the same month in 1918 is announced by the American Bosch Magneto Corp. The total last month was nearly 440,000 and the company's ambition is to make this year fully half the magnetos used in the world. The plant was taken over in 1918 by the alien property custodian, but the new owners did not gain possession of the property until a little more than a year ago.

HAYES COMBATS LIVING COSTS

JACKSON, MICH., April 10—Hayes Wheel Co. employees have opened a co-operative store to combat the high cost of living. The storekeeper, who is employed by the company, "tends store" at noon and after five o'clock in the afternoon and after ten o'clock on Saturdays. By an arrangement with wholesale dealers employees are enabled to save a material amount on their foodstuffs.

SMITHS' COMPANY NEW

SPRINGFIELD, MASS., April 12.—The Smith Springfield Body Corp. is rapidly preparing to get into construction. Hinsdale Smith, president of the new company, and his brother Arthur, who is treasurer, have brought to the business the knowledge of body building which made the famous "Springfield Tops" such a success, but their company has no connection whatever with the original Springfield Metal Body Co. and the capital behind it is entirely new.

Flood of War Planes Feared by Makers

Anti-dumping Legislation Will Be Sought to Protect Industry

NEW YORK, April 12—Belief among American aircraft manufacturers that foreign makers are preparing to flood the United States with discarded machines of military types, has been strengthened by the announcement that Handley Page has purchased $50,000,000 worth of planes and equipment from the British government. Similar plans are believed to be in the making by Sopwith and Avro interests.

The exact purpose of Handley Page's visit to this country has not been disclosed, although it was ostensibly to investigate the feasibility of establishing commercial aerial routes. It is believed, however, that he also made extended inquiries concerning the possibility of finding a large market here for second-hand British planes.

Caproni, the famous Italian aircraft maker, now is in this country and has not announced his precise plans, but so far as can be learned he is considering the advisability of establishing an American plant for the manufacture of his planes for commercial purposes. He would use American labor to a large extent and American makers do not object to foreign competition along commercial lines.

Representatives of Farman, also, are in this country, and they are supposed to be seeking a market for surplus French military machines. German makers have their eyes on America, too.

The contention of American manufacturers is that the widespread and indiscriminate sale of foreign machines designed for military purposes would give a black eye to aviation in this country. They point out that there would be no foreign mechanics here to overhaul them in case of accident and that Americans would not be familiar with their structure. Nor would there be available a supply of spare parts. The result would be, it is asserted, that if a man bought one of these planes and had trouble with it he would become so disgusted he never would want to see another air vehicle.

Would Glut Markets for Years

Another argument brought forward against foreign planes of military make is that their introduction here on a wholesale scale would supply the demand for a long time to come to the disadvantage of American manufacturers.

Congress is not blind to the menace of the situation and it is expected anti-dumping legislation will be enacted which would attach a prohibitive tariff to the importation of discarded military airplanes. Nothing would be done, however, to discourage foreign manufacturers from trying to find a market here for commercial machines of the newer types.

METAL MARKETS

AUTOMOTIVE INDUSTRIES begins to-day the publication of a weekly review of the situation in the metal markets which is designed to be authoritative and forward-looking rather than a résumé of what already has happened.

Pig Iron.—Before the railroad strike put a crimp into activity, the market had displayed unmistakable signs of the formation of a fresh buying movement. Middle West advices disclose a good demand in the automotive industries.

Iron and Steel.—The premium market for automobile sheets was on the point of vanishing when interruption in rail transportation again stressed the paucity of the reserves of certain consumers. For the time being, warehouse steel of all kinds is eagerly sought after, regardless of the expense entailed in securing immediate delivery. In the aggregate, however, this business is of retail proportions. Several large automotive interests are reported to be negotiating for good-sized tonnages of alloy steels for third quarter 1920 deliveries. Sheet bars are nominally quotable at $70 to $80.

Aluminum.—Thanks to the steadily expanding use of this metal in the automotive industries, both in rolled form for bodies and in castings, the transition of the aluminum industry from a war to a peace basis has been accomplished in such a way that the probabilities are for a record-beating consumption in 1920. When the Government ceased buying for war purposes, the sole producer was apprehensive lest the task of educating the public to the use of aluminum would have to be started anew. The astounding increase in the aluminum takings of the automotive industries, estimated to be now at the rate of more than 100,000,000 lb. a year, solved the producer's problem. The market is firm at 33c. for virgin ingots, 98 to 99 per cent pure.

Copper.—The boom which had its inception in a widely advertised report that a banking syndicate would finance exports was apparently shortlived. Producers ask up 19¼c., but resellers offer electrolytic at as low as 18½c. Casting copper is obtainable at 18⅜c.

Tin.—The market is easier, with Straits quoted at 63⅜c. to 63⅝c. Tin is cheaper in London than at Singapore, the English market basis being around 60c.

Lead.—Consumption is on the decline and the market is easy at around 9⅛c. to 9¼c., New York. As result of the railroad strike premium on spot is offered.

Zinc.—Uncertainty of deliveries caused a halt in buying. Prime Western is easy at 8⅜c. to 8½c., East St. Louis.

Antimony.—Quiet at 10½c. to 10⅝c. for ordinary, duty paid. Best Chinese quoted at 11c.

Brass.—Mills are unwilling to book orders for rolled brass far ahead. Labor troubles in the Waterbury district are responsible for this. One consumer bought yellow metal sheeting at 26¾c.

Mitchell Earnings $1,108,618 Report for 1919 Shows

RACINE, WIS., April 10—The annual report of the Mitchell Motors Co., the first to be made public in two years and the first since Mitchell activities have come under the management of President D. C. Durland, gives net profits equal to $8.86 per share before Federal taxes have been allowed for and $6.50 per share after liberal appropriations for taxes have been made.

The statement is a conservative one—in fact the reorganization policy of the company under Durland has been one pointing to substantial manufacturing policies. While redesigning the car, reorganizing the factory and largely changing the organization personnel, the management has written off $1,700,000 in depreciations and has fitted new machinery valued at $850,000. There are no bonds, no preferred stock or other funded debt against the company. The 125,000 shares of common stock of no par value are closely held and there is little activity among its shares on the stock exchanges. In the annual statement as of Dec. 31, 1919, the inventory includes only materials for 1920 cars carried at full cost value.

Mitchell is now building all of its own open and closed bodies, this being the first year it has built its closed types, such as sedans and coupes. The policy of making nearly all car parts, including forgings, has been persistently developed during the past year. The company has 3000 employees and built 1300 cars in March.

The annual statement shows the total liquid assets of $5,219,890.77 to be approximately 1½ times the current liabilities of $3,364,175.67, which as a strong ratio for a concern of Mitchell's size. The assets do not include any items on patents or goodwill. The item of $38,-137.03 in the assets has been paid by the United States Government since the statement was made and was in war work.

Since completing its war contracts of F. W. D. trucks a complete rearrangement of the factory has been carried out under R. C. Rueshaw, as a layout designed for production has been evolved. This has involved moving complete departments and arranging them in new sequence. Every foot of factory space has been utilized.

BALANCE SHEET MITCHELL MOTORS COMPANY, INC.

December 31, 1919.

ASSETS			
Current			
Cash			
In banks and on hand		$528,297.70	
Due from U. S. Government			
On truck contracts		381,137.03	
Notes and Accounts Receivable	$165,276.88		
Less reserve for doubtful accounts and notes.	31,500.00	133,776.88	
Due from subsidiary company	151,187.56		
Less reserve to reduce to cost	46,887.60	104,299.96	
Inventories			
Raw materials, parts in process, finished cars, repair parts, etc	4,222,379.20		
Less reserve for possible losses	150,000.00	4,072,379.20	$5,219,890.77
Investments			
Stocks in other companies, including New York Mitchell Motor Co		6,500.00	
Mitchell Motors Co., Inc., Stock purchased for employees, at cost		17,374.24	23,874.24
Permanent			
Real estate		445,951.51	
Buildings, machinery and equipment tools, patterns, furniture and fixtures	3,886,884.72		
Less reserve for depreciation	984,232.43	2,902,652.29	3,348,603.80
Other			
Sundry accounts and claims			24,282.65
Deferred			
Charge to future operations			51,143.15
			$8,667,794.61
LIABILITIES			
Current			
Notes payable		$2,390.000.00	
Accounts payable		665,602.56	
Dealers deposits		25,100.00	
Accrued			
Payrolls, insurance, U. S. Government Excise tax, real estate and personal property tax, etc.		283,473.11	3,364,175.67
Reserve			
For Federal and State taxes estimated			300,000.00
For contingencies			90,000.00
Deferred			
Balance on materials used on U. S. Government contract, subject to possible claim			37,909.64
Capital stock			
Common—125,000 shares, no par value			625,000.00
Surplus			
Balance—January 1, 1919		3,442,090.59	
Earnings—Year ending December, 31, 1919	$1.108,618.71		
Less reserve for Federal and State taxes	300,000.00	808,618.71	4,250,709.30

Rail Strike Ties Up Detroit Factories

Resort to Gasoline for Fuel Futile with Finished Cars Unshippable

DETROIT, April 14—Two days' operation with all power from the Detroit Edison Co., shut off as a result of the outlaw railroad strike, finds all automotive factories crippled, and some of them closed down entirely. Only the office force is at work at the Hudson-Essex plant, where 7500 men are employed normally.

Hupp is closed down completely; about 50 per cent are off at the Dodge plant, 35 per cent are out at Ford's, and all of the other plants are running with makeshift power plants, with from 15 to 50 per cent of their employees at work. In all between 160,000 and 200,000 employees in the automotive industry in Detroit and Michigan are out.

Willys-Overland production at Toledo will close down to-night. Knights will continue to be manufactured with emergency power plants, but no attempt will be made to operate in the Overland factory.

Packard is operating its full force, generating its own power, but how long the supply of gasoline will hold out is problematical. Maxwell-Chalmers is practically closed. In many of the other power plants power is being generated with gasoline engines, but, aside from Packard, the effort does not appear to be meeting with great success from a production standpoint.

The Ford Motor Co. main factory is operated by its own power, but the blast furnaces and body plant are dependent on the Edison company.

BIG FACTORY EXPANSION

AKRON, OHIO, April 10—Miller Tire & Rubber Co. has secured building permits aggregating $861,000 for factory expansions. The permits provide for three buildings, which will be constructed in response to the increased demand for products of the Miller factory.

METRIC SYSTEM OPPOSED

NEW YORK, April 12—Unanimous opposition to proposed legislation which would make the metric system obligatory has been voiced by the members of the National Automobile Chamber of Commerce. The organization will lend its support to the American Institute of Weights and Measures, which is combatting the metric system propaganda.

CENTRAL TOP INCORPORATES

INDIANAPOLIS, April 12—The Central Auto Top Co., a partnership since 1912, has incorporated, with a capital of $75,000. It will enlarge its capacity and add leather products to its manufacturing line. The officers of the new company are: President, William Swoboda; vice-president, Chester A. Carlisle; secretary, Charles Swoboda; treasurer, William Marble. The new line of the company will be under the personal supervision of Charles Swoboda, who was for 29 years superintendent of the Hide, Leather & Belting Co. of Indianapolis. The other three officers are the original partners who started in business in a barn in 1912 and built the business to its present proportions.

Navy Aero-hydro Scout Airplane

The plane is equipped with air bags which when inflated make it possible to alight on the water. One of the planes thus equipped during maneuvers at Guantanamo Bay was temporarily lost for forty-eight hours

Bendix New President of Parrett Tractor

CHICAGO, April 12—Vincent Bendix has been elected president of the Parrett Tractor Co. to succeed Dent Parrett, who retired to devote all his time to the recently organized Parrett Motors Corp., of which he is president. The Motors corporation will manufacture a truck designed especially for farm uses, and a motor cultivator. George A. Gibson is vice-president and general manager of the tractor company; Robert Barbour, vice-president and chairman of the board, and Russell A. Reed, vice-president and director of export sales.

Bendix is the inventor of the Bendix drive and is a director of several manufacturing companies. Gibson formerly was president of the Chicago Motor Truck Co. Barbour is general manager of the Barbour Flax Spinning Co. of Paterson, N. J. Reed, who formerly was with the Oliver Chilled Plow Works at South Bend, is now at the head of Russell A. Reed, Inc., of New York, exporters of agricultural implements.

Tractor sales will be in charge of E. F. Sanders, with the company for some time, while motor truck sales will be handled by Herbert Scharlach, until recently in charge of the western territory for the Republic Motor Truck Co. of Alma, Mich.

Willys-Overland Earnings $6,808,737

Pays Preferred Stock Dividends of $1,735,268 — Common Stock Disbursements Lower

NEW YORK, April 12—In presenting his annual report to the stockholders of the Willys-Overland Co., the statement is made by President J. N. Willys that there is a famine demand for cars in all parts of the world.

The company in the year ended December 31, 1919, returned net earnings, after repairs, maintenance, expenses, but before deducting expenses of developing and perfecting new models, of $6,808,737. Interest charges aggregated $1,471,671 and reserve for renewals and depreciation, $1,894,687. After $1,707,111 had been deducted for replacements, balance available for preferred dividends was $1,735,268. Holders of the preferred stock shared $1,632,732 in dividends, after which a $102,536 balance remained for common dividends. This amount fell short of the 1919 common disbursements by $1,527,321.

"Present conditions are highly satisfactory," said Willys's statement, "as production has reached 650 cars daily, and, in the near future, a daily schedule of 750 cars will be met and consistently increased as material conditions will permit. The first quarter of the year will show approximately 40,000 cars turned out, which is not quite 50 per cent of the total production in the year 1919, so that for the full year 1920 there is every reason to expect a final production in excess of 180,000 cars—the manufacturing goal for 1920 being 200,000 cars. Estimated sales for the year should be more than double those of 1919, which were $87,500,000."

March Production of 176,831 Establishes New Detroit Record

Labor Turnover and Railroad Tie-ups Fail to Slow Industry—April Outlook Not Promising Unless Relief Comes to Speed Deliveries of Material and Fuel

DETROIT, April 9—Spurred by the insistent demand for automobiles, manufacturers in the Detroit district, despite freight congestion, labor shortage, lack of parts and innumerable interruptions, broke all records for production in March with a total of 176,831 cars. The situation with the truck makers was on a par, and unless the railway strike, which resulted in a practically complete tie-up in the railway yards to-day forces a suspension of manufacturing, the record established in March will be greatly exceeded this month.

Production figures for March, although less than those announced for January, are actual figures, where as in January figures in some instances were schedules outlined rather than actual production. The total for January also included Ford trucks, which amounted to approximately 12,000.

A majority of the manufacturers fixed 20 per cent as the March increase over any other month in their history. This, too, in face of the fact that the production was 30 per cent under the output scheduled for March in most factories.

The shortage of freight equipment, which has necessitated drive-aways of a large part of the output, continues and unless the strike situation is cleared up speedily dealers will be forced to resort to the overland method for practically the entire output. At the same time the manufacturer is in about the same predicament as the dealer, for his trouble lies in getting his parts to the factory, and is almost as serious a problem as that of getting the finished cars away.

Trucks Rush Delayed Material

Material is being brought into the city from distant points by truck trains, and the output of cars is increasing daily in response to the extraordinary demand. What was believed to be the high water mark set last year is being surpassed, capacity increase and labor increase have been forced, and every department has been stimulated to utmost energies in the effort to supply the demand.

The labor situation as it is affected by common labor is bad. The high price demanded by common laborers is working a hardship on manufacturers, not from a financial standpoint, but in productive efforts. This is aggravated by the daily payment system inaugurated by independent contractors and by some manufacturers. A large proportion of the laborers who get 70 and 75 cents an hour and receive their pay when they leave at night work only a few days in succession.

In the majority of factories labor is paid semi-monthly. If a man quits he cannot get his money until pay day, and quite naturally he realizes the folly of lying around idle three or four days while awaiting pay day. The result is that the factory gets at least the full two weeks' time. A movement is on foot looking to an agreement that will put an end to the daily pay system, which employment managers insist is the cause of most of their production problems.

The housing situation, which affects to a greater extent the skilled mechanic and the better class of labor, still is acute. Civic officials and private citizens, however, are making strenuous efforts to overcome conditions, and buildings now are springing up all over the city and beyond the limits in the effort to care for the homeless now in Detroit, and thousands of others for whom employment is waiting.

Leads in Home Construction

Building Commissioner J. C. McCabe announced to-day that more than $22,000,000 had been spent on new home construction during the first quarter of 1920, and Detroit to-day leads all cities in the nation in the number of houses under construction.

Some idea of the labor problem is furnished by McCabe, who in describing difficulties encountered by contractors, declared men are working less than formerly despite the increased wages, and their productive effort is 25 per cent under that of the period prior to the war, when wages were less than half as much as they are to-day.

Recent cancellation by General Motors of vast expansion plans in Detroit and vicinity is said to have been caused by the feeling that the company was working against itself in paying the high prices demanded, and using up such a vast amount of available labor. Not only was the company competing against itself in the labor market, but the effort to rush the immense development was construed as creating impossible conditions for every one else, compelling a general increase in labor cost with no betterment in the labor supply.

With all these conditions facing the industry the record for March stands out pre-eminent. At the beginning of the year, when manufacturers announced schedules that in the aggregate totaled between 2¼ and 2½ million cars, they withheld about 20 per cent of the desired or proposed schedule. While figures for March are close to the announced schedule they are far behind the output that really was hoped for.

Packard sounded the most optimistic note. The company was able to get many more freight cars than conditions had led officials to believe possible. The company was well supplied with steel and was able to get parts in goodly amounts and sufficient to care for the month's production.

The Ford plant had an extraordinary month, turning out 80,008 passenger cars and 14,291 trucks, a total of 94,299.

At the Overland plant a schedule of 600 cars a day was maintained for the 27 working days in the month. Overland was handicapped, like all others, in the matter of freight cars in and out of the factory. The labor situation at the Overland plant eased up considerably, however, and officials declared the extra effort put forth by factory executives stimulated employees in all departments and increased the productive effort materially. Overland plans to reach a maximum of 800 cars a day in the near future, probably by June 1.

Report 20 Per Cent Gains

At the Hudson plant it was said production in March was 20 per cent in excess of any month in its history. The same situation prevailed at Cadillac, Dodge, Paige, Columbia, Hupp, Liberty, Maxwell and in a majority of the plants outside of Detroit. Factories out in the State in fact were better off than those in Detroit insofar as parts and material supply was concerned. They were handicapped greatly by the lack of freight cars to move the finished product and were compelled to drive away most of their cars and store the remainder of the others.

Jackson Motors Corp. was able to secure but one freight car a day on an average, and was compelled to utilize space in the State fair grounds for storage. Incoming freight conditions, however, were better than during the previous month, and the company was not handicapped by lack of parts.

Briscoe has had no freight cars for several weeks, but has been getting parts in good quantity. Briscoe officials said while March was extraordinary from the production standpoint, it could hardly be said to be the greatest in the company's history. Plans for April, officials said, contemplate a great increase over that of March, unless the present freight strike forces a tie-up.

Further Increases Sought

At the Packard plant 815 cars and an equal number of trucks were built during March, and the plans for April call for a 25 per cent increase. The Studebaker plant in Detroit, while exceeding all previous schedules, was just up to 5,000, the number outlined as the probable production. Studebaker experienced a tightness in the matter of parts, but was able to make the schedule and will greatly exceed the March production during the present month. Saxon Motor Car Co. is not yet in production of finished cars, but is sending stripped chassis to all distributers for display purposes.

With the new cars soon to be in production in Detroit, and manufacturers of all cars aroused to keenest effort by the insistent demands, the scheduled output probably will exceed the announced total.

Preferred Motors to Build in Louisville

Company Representatives Seek Factory Site — Plan 10,000 Production in Three Years

LOUISVILLE, April 12—Louisville is to be the home of the Preferred Motor Car Co., capitalized at $2,000,000, which proposes, in three years after establishing a factory here, to turn out 10,000 cars a year.

Representatives of the concern, with temporary offices at Indianapolis, have been here for some time looking for a suitable factory site and conferring with officials of the Louisville Industrial Foundation.

The concern, according to its president, F. W. Young, will employ about 1000 men, and will bring to Louisville 400 skilled workmen. It proposes to turn out 3000 cars during its first year of operation.

The company, Young said yesterday, will build its cars, passenger and truck, on the interchangeable parts system. They will range in power from 25 to 40 horsepower, and will be put on the market at from $1,200 to $1,400 each. It is proposed to dispose of $1,000,000 of stock to Kentucky people.

AUSTIN OUTLINES OUTPUT

LONDON, March 29 (*Special Correspondence*)—The interest taken in the British Austin Motor Company and its prospects of making good, having regard to its large capital and vast acreage of buildings are shadowed by the following reference at the annual meeting, at which the chairman stated that the schedule of production for this year, called for by orders actually in hand, requires a weekly output of 200 Austin "Twenty" cars; 100 Austin farm tractors; 60 1½-ton lorries, and 500 electric lighting sets. Besides these, a large number of switchboards and other electrical equipments, and at least 25 complete airplanes will be made weekly. Austin cars are beginning to be seen about, which is sufficient evidence of production having been considerably increased. ENGLISHMAN.

(*Continued from preceding page*)

New Cars Are Held Over

Lincoln Motor Co., which was expected to be in production in April, has experienced delays and handicaps that make the date of delivery of Lincoln cars problematical. Wills-Lee also has been delayed, and the new car, which rumor says will be an eight, is expected to be in production some time in June.

Friend Motors Corp., which took over the old Olympian, has changed the specifications in many respects, and is building cars.

No cars were built by the Harroun Motors Corp., the Handley-Knight Co. at Kalamazoo, or the Jacquet at Belding. Handley building construction is being rushed as rapidly as possible, and the plant will be in production within 90 days. Jacquet building construction is completed, and the company is held back only by lack of one or two parts. While the future cannot be foretold, Jacquet officials hope to be in production by May 1. They will build nothing at the present but a roadster and sport roadster. Harroun Motors still is undergoing refinancing plans and no date has been fixed for a start on actual production.

Craig-Hunt to Make New Low Priced Car

INDIANAPOLIS, April 12—The Craig-Hunt Motors Company has incorporated for $1,000,000 to manufacture a small, low-priced passenger car. The following officers have been elected: J. R. Craig, president; W. L. Hunt, vice-president; C. L. Zechiel, secretary and treasurer.

The Craig-Hunt Motors Company has absorbed Craig-Hunt, Inc., which has for the past five years been manufacturing Ford speed specialties. The new company will manufacture two different style passenger cars—a 5-passenger touring car and a 2-passenger roadster. The present company will continue to make and market Ford speed specialties.

The executive offices of the Craig-Hunt Motors Company will be in the Claypool Hotel until their new administration building is completed.

BRITISH SELL ARMY TRUCKS

LONDON, March 29 (*Special Correspondence*)—It is officially stated that 17,646 trucks and truck chassis, the property of the British Government, have been disposed of for $35,500,000; 8843 cars and light trucks (ambulances) have been sold for nearly $6,000,000, and 15,058 motorcycles for over $300,000. These rates are at the pre-war conversion of the pound sterling.

There remains an immense number of trucks to be disposed of; large numbers of them being parked at the Government re-conditioning works at Slough, near London.

PROPOSE AERIAL POLICE

CINCINNATI, April 10—Details of a proposed system of aerial police to protect the entire state of Ohio will be presented to the convention of the associated aviation clubs of Ohio to be held at Columbus, May 6, 7 and 8. The air force would provide protection for concerns having long and complicated lines of transportation or communication.

FISK ENTERTAINS ENGINEERS

SPRINGFIELD, MASS., April 10—The Engineering Society of Western Massachusetts, with more than 125 members present, was entertained at the plant of the Fisk Rubber Co., last week, in connection with a regular meeting of the organization. The afternoon was passed in inspection of the plant. Dinner was served in the Administration building, followed by a brief business meeting.

Industry Kept Going by Big Truck Fleets

Chicago Falls Back on Motor Vehicles When Strike Ties Up Railroads

CHICAGO, April 12—Once more the motor truck has been called upon to keep Chicago's business running. Without the truck the strike of railroad switchmen probably would have completely paralyzed some of Chicago's most important businesses. As it was, however, the trucks performed such valiant services that the man on the street scarcely was aware that the city faced one of its most serious transportation crises.

The meat packing industry is vitally dependent upon continuous freight service, but the packers called upon the motor trucks and saved the situation. Big fleets of trucks employed by the great packing firms were called upon to take up the tremendous task of supplying branch houses and car route stations within the Chicago zone.

Within a few hours after it was definitely known that the wheels of refrigerator cars could not be turned, new motor truck routes were laid out to cover a zone stretching fifty miles in every direction from Packingtown. Every available truck was requisitioned for this long distance service while city transporation was turned over largely to lighter vehicles.

On the second day of the shutdown, motor trucks of Swift & Co. carried fresh meat and prepared food products to the extent of 400,000 pounds in excess of their normal truckage. In addition to the regular fleet, ranging in capacity from 3½ to 7 tons, a number of vehicles were engaged from outside sources in order to meet the heavy demands of the Chicago territory.

Similarly, other big industries in Chicago were forced to turn to the truck to keep their wheels moving. In many instances it was found freight consigned to Chicago had got as far as cities from 50 to 100 miles away where the cars were held up. Business houses were kept busy tracing these loads and once located trucks were dispatched to the cities, the cars unloaded and the freight brought into Chicago by truck. Almost every sort of commodity was handled in this way with the result that Chicago's business was saved from a complete paralysis.

WOULD OPEN CANADIAN TRACT

WINNIPEG, MAN., April 10—Approximately 5,000,000 acres of land would be opened up by the construction of a great highway which it is proposed to build from the Great Lakes in Ontario to this city. The Manitoba government is prepared to complete a portion of the road if the Ontario government will co-operate as it has been urged to do by the business interests of central Canada.

Mergers Strengthen British Companies

Production of New Models by Combined Firms Slowly Getting Under Way

LONDON, March 29 (*Special Correspondence*).—As the motor industry tends to settle down to normal conditions, it is becoming apparent that there is no business future for a number of companies, though some of them are responsible for designs of intrinsic interest, and the stability of others is likely to be attained only by fusion.

The Cosmos Co. of Bristol is one instance in the first score. This company, after a fairly successful war experience, during which they brought out some high grade radial engines, notably the "Juno" and "Jupiter" models, introduced at Olympia a three cylinder air-cooled car styled the C. A. R., which received much attention because of its somewhat novel layout and the comparatively low price at which it was listed.

Formerly the Cosmos interests were allied with the Straker-Squire Co., of London, but the latter company went out on its own, and is concentrating on a "six" car and a much better known, becaused longer established, line of trucks. This latter company bought a Government factory at Edmonton, London, for about $500,000. The Cosmos Engineering Co. continued as a separate venture in the old, but much enlarged works at Fishponds. It is reported that Roy Fedden, engineer and designer of the C. A. R., and designer of the pre-war Straker-Squire 15" four cylinder car, which the new Straker-Squire "six" has superseded, is interested toward acquiring the Cosmos interests.

The recent fusions referred to are the absorption of the Hillman Car Co., by the Triumph Cycle Co., Ltd., both of Coventry. The Hillman Car has been on the market for some years, and may now be developed for an output comparing with its merits. Another fusion and absorption is that of the Albert car interests by Gwynnes, Ltd. of Hammersmith and Chiswick. The Albert is a new "four," the first post-war product of a designer named Lord, associated with Adam Grimaldi & Co., aircraft builders during the war.

Gwynnes' Seek New Capital

Gwynnes' are now out for more capital (debenture stock), apparently on the strength of this fusion, the sum asked for being $1,500,000. This company is old established as makers of steam pumps and considerably benefitted by the war, during which the factory at Chiswick was busy with Clerget aircraft engines. A first year's output of 5,000 Albert cars is scheduled for, and it is stated that 3,000 were ordered at the Olympia show. The works engineer is W. Channell, formerly with the Lanchester Company of Birmingham, and is said to have a 15 years experience of mass production in the United States. The chairman or president of Gwynnes is also a director of the Napier company.

Messrs. Grimaldi and Lord, of Adam Grimaldi & Co., having severed connection with the Albert car, are preparing to build a "six."

The Ensign "six," another post-war British car which made its début at Olympia, is to be built by the Crabtree Co., a large engineering firm in Yorkshire, with branches in London. The pioneer specimen of the Ensign chassis was remarkable for its robust appearance, suggesting more weight and "trimmings" than are liked now-a-days.

The Harper-Bean Co. has taken over the output of the A. B. C. Motors, Ltd., another new (post-war) product which was exhibited at the November Olympia show. The designer is Granville Bradshaw, who achieved some reputation in the war for aircraft motors. The A. B. C. has a two cylinder opposed, horizontal air-cooled engine, four speeds and reverse gear and spiral-bevel a.c. gear. Apparently the Harper-Bean group believe there is a future for this class of layout, which is curious considering its trend toward and increasing appreciation of "sixes" and more cylinders in Europe generally.

ENGLISHMAN.

British Plan Special Car for South Africa

LONDON, March 29 (*Special Correspondence*)—A scheme is afoot for building in England a special Colonial model British car. The chief sponsor of the scheme is in London, and hopes to see it successfully through before he returns to South Africa, where he has a prosperous motor car and truck business. His firm handles American as well as British vehicles, and he has expressed satisfaction with the American wares, in fact, it seems that most of his present purpose is concerned with gingering up British makers by showing what their American competitors are doing.

The proposed car, it is understood, is to be build solely for the Colonial market, and, therefore, will not compete with any home product on the British market. As the scheme has not got beyond the quantities estimating stages, it will suffice to mention that estimates for its cost range from $2,000 upwards. It may be expected to sell in South Africa at $3,500 provided the factory cost does not exceed $2,500.

ENGLISHMAN.

MEXICAN GASOLINE RAILROAD

MONTEREY, MEXICO, April 12—An initial appropriation of 800,000 pesos, which is equivalent to $400,000 American money, has just been made by the State of Nuevo Leon for the construction of a 70-mile gasoline motor railroad that is to run from Monterey through a rich agricultural and mining country extending to the east and south of here. It is stated that the total cost of the proposed railway will be approximately $2,000,000. The survey has been made.

Murray Motors in Receiver's Hands

Only Assets of Company Are Plant Site and Building in Newark

NEWARK, April 12—The Murray Motor Car Co. has been forced into a receivership by the action of creditors. John W. McGeehin, an attorney, has been appointed receiver by Vice Chancellor Backes upon application of counsel for the Colyer Printing Co.

McGeehin said to-day his first move would be to place in the hands of real estate brokers the site on Frelinghuysen Avenue which the company had contracted to buy from the Samuel Jones Co. for $50,000 and on which $2,000 had been paid, and the building, which was to have cost $100,000, on which the company had paid but $5,000.

McGeehin said the Murray company, which was incorporated under the laws of Delaware only last fall, had had several sets of officers and he had not yet been able to determine who was who among them at the time he was appointed.

The question had been asked as to what will happen to the people who subscribe to stock and have not yet completed their payments.

"This is a matter I will have to study later," the receiver declared. "I will not take that up until I have made arrangements to dispose of the only assets I have been able to locate—the site and partly completed factory."

The company, as far as the receiver can learn, has not manufactured or assembled a car since it was incorporated.

The petition of the Colyer Printing Co. gives the Murray assets as $93,000 and its liabilities as $89,000, but included in the assets are a number of unpaid stock subscriptions.

A. J. Butler of Jersey City, who represents most of the stockholders, agreed to the receivership.

LONG BODY PLANT MAY MOVE

FRAMINGHAM, MASS., April 9—Efforts are being made to get R. H. Long to move his body making plant from this city to Worcester, where it is proposed to give him greater facilities for shipment and other things than he has at present here. While the matter is being considered nothing is being given out so that in case Long should decide to go he would not be held up by land profiteers. With enlarged facilities he could employ 4500 people, and in Worcester there would be enough interest to keep good men contented, while now they have to go to Boston, some 20 miles, when they want to have a holiday.

TO OPEN EUROPEAN OFFICES

NEW YORK, April 13—F. B. Caswell, sales manager of the Champion Spark Plug Co., Toledo, will sail for Europe April 20, to open branches of the company in London and Paris.

European Racers Prepared to Sail

Peugeot Racing Team Will Be First to Arrive — Fiat Speeds Models

PARIS, April 3 (*Special Correspondence*)—Jules Goux and André Boillot, European members of the Peugeot racing team, will sail from Havre on April 17, bringing their new mounts with them. The new 183 cu. in. Peugeots have already been on the road and have created a very good impression.

Jean Porporato and Jack E. Scales are shipping their two Porporato cars from Havre on April 24, and will sail from the same port on La France May 1. Porporato has already raced on all the American tracks, his best performance being at Chicago. Jack Scales is an Englishman who, until quite recently, was a member of the Fiat racing team. He was picked to drive a Fiat at Indianapolis in 1917, when the war caused this race to be called off. This is his first appearance in America.

The Porporato cars, which have been designed by one of the best specialist engineers in France, have been built privately in Paris. The few experts who have seen them pick them out as powerful contenders for the first prize.

In all probability the Ballot racing team will sail from France on May 1. The drivers picked are Jean Chassagne and René Thomas. The third driver is Ralph De Palma. It is quite possible that Ballot will enter either one or two small cars of only 122 cu. in. It is not expected that these will provide the winner, but Ballot is certain that they will make a sensational performance. The Ballot 183 cu. in. racers have eight cylinders in line; the baby Ballots have four cylinders.

News from Italy is to the effect that Fiat is working day and night on three racing cars. At the present moment it is not absolutely certain that these can be ready on time. Fiat has gotten out entirely new designs, with engines reputed to run at 5000 revolutions a minute. Louis Wagner, captain of the team, is on the spot, and if not able to ship his cars in time for the race, he undoubtedly will be the most disappointed man in Europe.

Practise Prohibition Diet

Competition among European racing drivers never was so keen as this year. André Boillot, who is the most daredevil driver France has ever produced, put himself into severe training three months ago and has sworn that he will bring the first prize back to Paris. René Thomas has not forgotten his defeat in the Targa Florio nor his ill-luck in the last Indianapolis race. Thomas is "the Silent Frenchman," but if anybody ever dares to doubt his ability to pull down the first prize he gets excited and loquacious. When America went dry Boillot and Thomas did likewise, so as not to feel the effects of a new régime on reaching America. Although the greatest fight is expected between these two, there will be some hard driving from Goux, Chassagne, Porporato and Scales.

Among the Europeans who are expected to come for the race are M. Ballot and his racing engineer, Henry; Owen Clegg, chief engineer of the Darracq Co.; Louis Coatlen, of the Sunbeam Co.; Charles Faroux and W. F. Bradley.

Despujols Glide Boat Does 74½ Miles an Hour

PARIS, March 28 (*Special Correspondence*)—A speed of 74½ m.p.h. is claimed to have been attained on the half-mile basis by the Despujols gliding boat while practising on the Seine for the Monaco races. This boat, which is a stepped hydroplane, is fitted with a Sunbeam 12-cylinder 450 hp. airship engine, similar to those used aboard the transatlantic airship. The engine runs at 2100 r.p.m., but the screw is geared up to 3000 r.p.m. This is the first time a geared-up screw has been used, the long accepted theory being that cavitation set up at 1800 r.p.m.

This speed performance, if correct, would constitute a world's record. It has to be pointed out, however, that the timing was done by stop watches held by persons on the bank. Every year higher average speeds have been claimed for boats on the Seine than it was ever possible for the same craft to attain over the measured mile and kilometre in Monaco Bay. This can be attributed to inaccuracies in timing, to the help obtained from the current, and to the smoother water prevailing on the river. There is no doubt, however, that Despujols-Sunbeam is the fastest boat ever built in France.

Fidelity Tire to Bid On Camp Taylor Site

LOUISVILLE, April 12—D. Dierenburg, wealthy Chicago auto tire manufacturer, has been in Louisville during the past week looking over a site for an automobile factory. He was here for several days and inspected Camp Zachary Taylor. He imparted the news to a friend before returning to Chicago that he would bid on the salvage of the camp when the Government decided to dispose of it.

It is understood that Dierenburg's intention is to open an automobile factory in Louisville in the near future and that he is desirous of getting the camp site if he can buy the buildings reasonably and get satisfactory leases on the land. Dierenburg makes the Fidelity tire at Chicago.

SOUTHERN OFFICES MOVED

ITHACA, N. Y., April 12—The Morse Chain Co. has removed its southern headquarters from Greensboro, N. C., to the Commercial Bank Building in Charlotte, North Carolina.

Publishers to Act on Car Publicity

Manufacturers Will Ask That Restrictions Be Made on All Free Matter

NEW YORK, April 12—Whether or not New York newspapers shall place the most stringent restrictions on publicity will be determined by the final vote of the individual members of the Publishers' Association which will be taken soon. A committee which has been investigating the question has recommended that such a step be taken.

If the code proposed is adopted it would forbid the papers using the names of individual automobiles except during show week and in connection with races in which three or more cars are entered.

The National Automobile Chamber of Commerce has asked to be given a hearing on the question and the request has been granted. It will be pointed out that automobile advertising carried in New York papers amounts to approximately $2,750,000 a year, which places the industry well to the front among groups of advertisers.

The position is taken that if newspapers will place the same restrictions upon publicity for real estate, theaters and baseball, no objections whatever would be interposed. It is argued, however, that automobiles play just as important a part in the life of the people of the country as theaters and that they are entitled to equally liberal treatment in the news columns.

It is not believed that the papers intend to eliminate from their columns any real news. They assert, in fact, that such is not their purpose. The publishers contend that their space is especially valuable just now because of the shortage of print paper and they intend to scan all publicity closely to see what has real news value. Having taken this position they say it is now up to publicity men to produce material which they cannot afford to throw away.

MAXWELL EARNINGS, $2,992,000.

NEW YORK, April 12—President W. L. Mitchell, of the Maxwell Motor Co., reports to the stockholders that on a production of 49,746 cars and trucks in the eight months ended March 31 last, earnings were returned of $2,992,000. He says demand is far in excess of production and that the fiscal year which ends July 31 should show gratifying results.

BETHLEHEM DESIGNS NEW CAR

NEW YORK, April 14—The Bethlehem Motor Truck Corp. will bring out a passenger car, for export only. The car, which will have a Bethlehem engine and Timken axles, will be of the 4-passenger sport type popular abroad, and will sell for about $3,000. It is expected that production will be under way shortly at the factory in Allentown, Pa.

Automotive Financial Notes

Hayes Wheel Co.—Announces it has completed plans to double this year its output for 1919 when 956,991 sets of wheels were shipped. Net sales for all plants in 1919 amounted to $14,686,383, while goal set for this year is $30,000,000.

Block Tire & Rubber Co.—Capitalists from Terre Haute, Ind., became interested in company and will increase capitalization to $1,500,000. New plant proposed to supplant small one at Lafayette, Ind.

Dayton Rubber Mfg. Co.—Increases capital to $10,000,000. Part of proceeds will be used to enlarge present plant.

Lincoln Motor Co.—Declares initial quarterly dividend of $1.25 a share on Class A stock.

Overman Cushion Tire Co.—Stockholders meet April 15 to increase stock from $250,000 to $550,000.

Peerless Truck & Motor Corp.—Annual report shows net sales of $12,928,601 with net income of $806,648, and a surplus for the year of $670,628, making a total surplus of $5,259,600.

Quality Tire & Rubber Co., Anderson, Ind.—Arranges to consolidate with Long Wear Tire & Rubber Co., Elyria, Ohio, under latter name. New corporation will have capital of $5,000,000.

Timken-Detroit Axle Co.—Has appropriated several million dollars for additional buildings and equipment to increase output 50 per cent in 1921. Financial statement discloses surplus of $10,175,579 at close of 1919.

Binghamton Electric Truck Co., Binghamton, N. Y.—Incorporated with $200,000 capital.

Oshkosh Motor Truck Co.—Engages architects to design additional buildings to cost $150,000.

Empire Motors, Ltd.—Incorporated at Toronto with $250,000 capital to make automobiles, airplanes and motorcycles.

Gale Motors Corp.—Chartered at Indianapolis by Gard Gale and others to build automobiles.

International Motor Truck Co.—Declared stock dividend of 100 per cent on common. Reports production last year of 5015 trucks and production scheduled for this year of 9000. Announcement indicates new stock will be sold.

Standard Motor Construction Co.—Declared usual quarterly dividend of 2½ per cent.

Goodyear Textile Mills Co.—Los Angeles bankers underwrite $2,000,000 of company's preferred stock. Proceeds, including proceeds from sale of $1,000,000 common stock to Goodyear Tire & Rubber Co., will be used to erect plant and for working capital. Plant will have capacity of 33,000 spindles and output will be sold to Goodyear at 10 per cent profit.

Bowen Motor Railways Corp.—Organized at St. Louis to build gasoline propelled railway cars. A. D. Bowen is president. Proposes plant covering 20-acre site.

Kelly-Springfield Tire Co.—Declared regular quarterly dividend of $1 a share and a quarterly dividend of 3 per cent in stock on common as well as 2 per cent on preferred.

McGraw Tire & Rubber Co.—Declared quarterly dividend of 1¾ per cent on preferred.

McCord Mfg. Co., Inc.,—Offers 25,000 shares of common stock at $43 a share. Announces that it expects net earnings before Federal taxes to reach $1,500,000 in 1920. Tangible assets applicable to common stock of consolidated companies amount to $4,523,536.

Bruhn's Mfg. Co.—Incorporated at Hammond, Ind., at $95,000, to manufacture a double eccentric jack. Plant soon will be in full production. Daniel Bruhn is president.

American Die Casting Co., Indianapolis.—Purchased for $250,000 by T. A. Lavelle, T. J. Jones, and A. D. Hoover. Name changed to American Bearing and Die Casting Corp., and capital increased from $100,000 to $750,000.

California Aircraft Corp.—Organization announced by John Crick, San Francisco. Will build plant for construction of medium priced two seater airplane.

Premier Motor Corp.—Initial offering of company's stock announced. Capital authorized is $2,000,000, half of which is outstanding.

Avalon Rubber Mfg. Co.—Capital increased from $200.000 to $1,000,000. J. F. Hower elected president and general manager.

Columbus Auto Parts Co.—Increases capital from $150,000 to $300,000, and will build new factory adjacent to present plant.

Mustor Mfg. Co.—Amalgamation of Triangle Packing & Rubber Co. and Mitchell-Barnes Mfg. Co., with headquarters at Grand Central Terminal, New York, will manufacture a line of packings and mechanical rubber goods.

Motor Products Corp., in a statement filed with the stock exchange, reports net profits of $979,026.69 for 1919, before Federal taxes and Canadian business profits war tax. This is an increase of about $300.000 over the previous year. Surplus is $2,612,579.71, an increase of approximately $1,000,000 over 1918.

Hayes Manufacturing Co., of Detroit, reporting to the stock exchange, shows net profits, after Federal taxes, of $131,697.21 for 1919. Total assets were $2,615,780.36, and surplus $142,770.03. Current assets were $1.313,140.07, and liabilities $173,010.33. Property investment less depreciation was $1,139,307.56.

Lincoln Motor Co. declared its first dividend on Class A stock this week, despite the fact that the company is not yet in production. The dividend was paid out of a surplus remaining from the production of Liberty engines.

U. S. Rubber Co. has declared a 2 per cent dividend on common and first preferred, both payable April 30 to holders April 15.

Ford Motor Co.—Will pay off $7,500,000 of its outstanding 6 per cent notes on April 16. This maturity is part of underwriting of $75,000,000 three months 6 per cent notes undertaken last fall by a syndicate of bankers headed by Chase Securities Corp. Only $60,000,000 has been drawn thus far and $17,500,000 of this amount already has been paid.

Mullins Body Corp.—Reports that for first quarter of 1920 it earned approximately $250,000, and predicts that net profits after Federal taxes will amount to $900,000 for the year.

Intercontinental Rubber Co.—Reports net profits of $101,111, or 35 cents a share on its stock for year ended Dec. 31.

Bank Credits

Written exclusively for AUTOMOTIVE INDUSTRIES *by the Guaranty Trust Co., second largest bank in America.*

Money rates are unchanged, except for stock exchange call money, which advanced to 10 per cent last Monday. The railroad strike has undoubtedly hampered liquidation through hindering the free movement of goods. April wheat crop figures, published during the last week, show prospects of the smallest winter wheat crop in a number of years.

Gold has reversed its movement during the last week and returned to the possession of the interior Federal Reserve banks at the expense of the New York Reserve Bank. The result was that, in spite of the importations of gold from England, the New York Bank showed a loss of nearly $25,000,000 gold last Saturday, while the system as a whole gained $7,200,000 gold. The New York condition was further reflected by a decline in the surplus reserve of the Clearing House banks.

Gold has once more begun to move to the Argentine, roughly $10,000,000 having so far been engaged. Government deposits in Federal Reserve banks are still declining and on Friday last were at the lowest figure for the present movement—$8,750,000.

WICO ELECTRIC TO BUILD

SPRINGFIELD, MASS., April 10—A modern factory, ultimately to consist of four units with accommodations for 1500 employees, is to be started this spring by the recently incorporated Wico Electric Mfg. Co., formerly the Witherbee Igniter Co. Architects are drawing plans for the first building of the four units, to cost between $100,000 and $150,000.

Minneapolis S. A. E. Discusses Tractors

Paper on Weight and Drawbar Pull Shows Trend Toward Higher Speeds

MINNEAPOLIS, April 10—At the monthly meeting of the Minneapolis Section this week a paper on Tractor Weight and Drawbar Pull was presented by A. F. Moyer of the Toro Motor Co. The paper dealt chiefly with the proper distribution of weight in a four-wheel tractor with rear wheel drive, in order to prevent loss of steering control and overturning.

Moyer said that the best weight for a tractor of given horsepower must be a compromise based on the many conditions to be encountered by a given machine or by different machines of the same model. While weight will logically bear some relation to drawbar pull, the latter in turn depends upon tractor speed. Having established total weight and speed, the next item for consideration is weight distribution.

Slow moving tractors will always involve heavier weight, both for the strength of parts and for obtaining the necessary traction to develop the larger drawbar pull. High speeds, on the other hand, permit light construction. Tractor implements will soon be adapted to higher speeds, so that the limitations of draft-horse speeds will no longer hamper the tractor as a branch of the automotive industry. Good plowing at 3 to 4 m.p.h. ought soon to become possible without sacrifice in efficiency.

Taking the speed at or near the highest at which good work can be done efficiently, the drawbar pull is readily determined from the drawbar horsepower, or vice versa. The ratio of drawbar pull to the total tractor weight is next for consideration. In a few exceptional cases this ratio has shown on test a value as high as 100 per cent, but will probably be nearer to 70 per cent for average conditions with rear drive wheel machines, depending on wheel equipment and weight distribution.

Having arrived at the desirable tractor weight, the designer must use his skill to keep within the desirable limit and at the same time to make the best disposition of the weight at his disposal. Drive-wheel efficiency will be increased by larger diameters, thus permitting the use of a smaller motor for the same drawbar horsepower delivered. The elimination of excess weight also reduces the necessary motor power by reducing the wheel rolling losses.

In his analysis of tractor stability, Moyer distinguished between four cases —drawing a load on hard level ground, on soft level ground and on soft inclined ground, and the tractor with its rear wheels sunk deeply into the ground and obstructed as by a log or rock in front of the driving wheels. In the first three cases moments were taken around the point of ground contact of the driving wheels and expressions developed for the condition of stability.

Moyer introduced the buoyancy of the loose soil in front of the rear wheel as a factor affecting the stability.

Discussion was offered showing that when the drawbar height above the ground is not considered, but instead the torque on the final drive gears is taken and the product of the drawbar pull into the distance of the drawbar below the rear axle deducted from this torque, the result divided by the wheelbase gives a weight lifted from the front wheels which seems to agree closely with experiment, whereas the analysis shown in one of the author's figures gave results entirely at variance with test data.

Men of the Industry

Howard L. Spohn, formerly of Motor Age, Motor World, Automotive Industries and Commercial Vehicle, and Frank A. Kapp, formerly of Motor Life, the Automobile Trade Directory and the Automobile Blue Book, have become associated with the Charles H. Fuller Co., advertising agent of Chicago.

William V. Lowe, formerly sales engineer with Hess Bright Co., and recently with Manning, Maxwell & Moore, Inc., has been appointed sales engineer of the Easton Machine Co., South Easton, Mass.

Hugo Gibson, until recently with the Vacuum Oil Co., is now with the Root & VanDervoort Engineering Co., Moline.

Nelson B. Nelson has resigned as assistant engineer of the J. I. Case Threshing Machine Co., Racine, to become associated with the Kardell Tractor & Truck Co. of St. Louis as superintendent and chief engineer.

J. C. Blair has been appointed manager of the Toronto office of Alfred Herbert, Ltd. He will be assisted by G. A. Keith.

H. A. Goddard, director of sales of the Sinclair Motors Corp., has been elected vice-president in charge of sales and a member of the board of directors.

William B. Walker, Jr., has assumed the duties of purchasing agent of the Dupont Motors, Inc.

Daniel O. Skinner, formerly advertising manager of the International Motor Co., has joined the Buffalo division of the Manternach Co.

Russell P. Askue has resigned from the publicity department of the National Lamp Works to enter a Cleveland agency.

Howard Wilcox, racing expert, has been appointed research engineer of the Cole company.

Charles H. Tavener has resigned from the Curtiss Aeroplane & Motor Corp., to open a consulting engineering business in Garden City, L. I.

Joseph A. Mackle will soon take over the Jordan distributorship in Great Britain and Ireland.

George C. Rea has become the representative of C. E. Johansson, Inc., in the Chicago territory.

Ryan Resigns Seat On Stock Exchange

Charges Discrimination by Committee in Proceedings Arising from Stutz Corner

NEW YORK, April 14—Allan A. Ryan made public to-day a letter sent to the Governing Committee of the New York Stock Exchange, announcing that, as a result of the proceedings taken in connection with the corner in Stutz stock, he could no longer continue a member and retain his self-respect. He asked that his seat be sold as soon as possible.

In his letter Ryan charged that members of the Governing Committee were partners in houses which, either for themselves or their customers, were short of Stutz stock and hence were sitting as judge and jury in a case in which they were financially interested.

The Protective Committee appointed to handle the interests of the shorts announced that Charles E. Hughes had been retained as advisory counsel.

In an earlier statement Ryan asserted that the corner in Stutz Motor stock was not of his seeking but was forced on him by the efforts of "sinister" influences to hammer down the price. He reiterated his offer of settlement made several days ago and added that while he was not seeking litigation he was ready to place the whole affair in the hands of the courts. In his statement Ryan said:

"The Stutz situation was not designed nor created by me. It was the result of persistent attacks on the stock by persons having absolutely no interest in the Stutz company, who were determined to profit by hammering down the Stutz stock and deliberately promoting a campaign for selling that which they did not own. They hoped to force down the price so as to buy the stock at ridiculous figures, in order thereby to reap a great profit at the expense of every stockholder, as indeed they would have done but for my ability to protect the company and its stockholders."

Texas Taking Cars as Fast as They Arrive

AUSTIN, TEX., April 14—During the first three months of the present year there were 316,843 motor vehicles registered in Texas, according to figures just compiled by the State Highway Department. It is expected that during the remaining nine months of 1920 fully 100,000 additional registrations will be made, making a total of approximately 416,000, as compared with 321,800 motor vehicles registered last year.

In every part of the State dealers report an unprecedented large business. This is particularly true of the rural communities. Farmers are buying automobiles as they never bought before. In the oil producing districts of Northern and Central West Texas the demand for high-priced cars is very great.

Calendar

SHOWS

April 21-28—San Francisco. National Aeronautic Exposition. Exposition Auditorium.

Oct. 6-16—New York. Electrical Show. Grand Central Palace. George F. Parker, Manager.

Dec. 10-18—New York. Motor Boat Show. Grand Central Palace.

FOREIGN SHOWS

May 15-June 13 — Cars, Parts and Accessories. Antwerp.

June 26-July 25 — Commercial vehicles, tractors, camions and engines. Antwerp.

July 9-20—London, England. International Aircraft Exhibition. Olympia. The Society of British Aircraft Constructors.

Aug. 7-Sept. 15 — Motorcycles, sidecars, etc. Antwerp.

October—London. Commercial Vehicle Show, Olympia.

November—London. Passenger Car Show, Olympia.

CONTESTS

May 1—Hanford, Cal. Dirt track.

May 31 — Indianapolis, Ind. Speedway.

May 31—Brockport, N. Y. Dirt track.

June 1—Omaha, Neb. Truck Reliability Run.

June 12—Uniontown, Pa. Speedway.

June 17—Portland, Ore. Dirt track.

June 19—Ogdensburg, N. Y. Dirt track.

July 4—Tacoma, Wash. Speedway.

July 4—Hanford, Cal. Dirt track.

July 4—Spokane, Wash. Dirt track.

July 5—Batavia, N. Y. Dirt track.

July 17 — Warren, Pa. Dirt track.

July 24—Watertown, N. Y. Dirt track.

July 31—Fulton, N. Y. Dirt track.

Aug. 7—Erie, Pa. Dirt track.

Aug. 14—Buffalo, N. Y. Dirt track.

Aug. 20-21—Middletown, N. Y. Dirt track.

Aug. 21—Johnstown City, Pa. Dirt track.

Aug. 28—Canandaigua, N. Y. Dirt track.

Aug. 27-8—Flemington, N. J. Dirt track.

August, 1920—Paris, France. Grand Prix Race. Sporting Commission Automobile Club of France.

Sept. 1—Glidden Tour—N. Y. to San Francisco.

Sept. 5 — Targa Florio Race, Sicily.

Sept. 6—Hornell, N. Y. Dirt track.

Sept. 6—Cincinnati, O. Speedway.

Sept. 6—Uniontown, Pa. Speedway.

Sept. 17-18—Syracuse, N. Y. Dirt track.

Sept. 25—Allentown, Pa. Dirt track.

Oct. 1-2—Trenton, N. J. Dirt track.

Oct. 8-9—Danbury, Conn. Dirt track.

CONVENTIONS

April 27-29—Atlantic City. Increased Production Convention, Chamber of Commerce of the United States.

April 29-May 1—Detroit, Mich. Fourth Annual Meeting and Convention, American Gear Manufacturers Ass'n.

May 9-12—Independent American Petroleum Congress, Congress Hotel, Chicago.

May 12-15, 1920—San Francisco. Seventh National Foreign Trade Convention.

May 20-30—Atlantic City. Third American Aeronautic Congress, Aero Club of America.

June 7-10 — Indianapolis, Ind. Annual Convention of the Associated Advertising Clubs.

June 22-25—Asbury Park, N. J. Annual meeting American Society for Testing Materials.

S. A. E. MEETINGS

June 21-25 — Ottawa Beach, Mich. Summer Conference.

Fuel Developments Indianapolis Topic

INDIANAPOLIS, April 12 — C. F. Kettering, president of the Dayton Engineering Laboratories Co. and formerly president of the S. A. E., will address the Indiana Section of the S. A. E. on "Developments of the Fuel Problem." During his talk he will demonstrate by actual operation some of the peculiar properties of fuels when introduced into the combustion chamber of the automobile engine.

Announcement of the meeting states that the experiments shown will be novel and surprising, and in view of the recent talks given by Kettering on this subject, a very interesting meeting is anticipated. In his laboratories, Kettering has gone into considerable research work on automotive fuels. It is stated that Major Schroeder, in his recent altitude record, utilized some of the results of these experiments. The speaker has developed an entirely new theory for what has hitherto been considered the causes of fuel knocks in automotive engines, and the coming lecture on this subject at the Indianapolis meeting is regarded as of particular interest, in view of his experiments on the characteristics of different automotive fuels which are now in use, or are possibilities for use in the immediate future. The meeting will take place on April 30 at the Hotel Claypool.

FORD TO SEND BAND

DETROIT, April 10—Edsel B. Ford, president of Ford Motor Co., will send the Ford band of 55 pieces and a staff of motion picture operators with the annual tour of Michigan Pikes Association July 14 to July 29. About 300 will join the tour, which will cover 1359 miles in the 15 days, 574 of which will be in Michigan and 785 in Ontario. A fleet of trucks carrying tents and full camping equipment, together with a farm lighting system, fire engine and facilities for tire and general repairs, and for the installation of shower baths will be at the head of the party.

Curtiss Airplanes Arrive in Hong Kong

NEW YORK, April 12—Word has been received by Guy T. Slaughter & Co., exporters, of this city, that 11 Curtiss planes shipped by them to the Orient to establish a commercial air route, have arrived at Hong Kong. With them went 16 aviators and mechanicians, most of them Americans. The backer of the enterprise, which is the first of the kind ever undertaken in China, is C. E. W. Ricau, a French resident of Macao.

The aerial service will connect Hong Kong and Canton with the Portuguese colony of Macao. Later the company expects to extend its activities to Manila and Tokio, touching at all points on the Chinese coast.

Walter Bonner, a veteran of the navy flying corps, will be general superintendent of the company.

SHIP FISH BY TRUCK

PORTLAND, ME., April 12—A shipment to New York on motor trucks of 22,500 lb. of fish was made to-day by local wholesale dealers. This was made necessary by the railroad strike situation in New York.

Machinery Makers to Push Production

NEW YORK, April 12—Directors of the Material Handling Machinery Manufacturers' Association have elected as president Charles F. Lang, president of the Lakewood Engineering Co., Cleveland; Rumsey W. Scott of the Otis Elevator Co., this city, has been made vice-president and chairman of the board of governors.

The association announces that more and more manufacturers are discarding pre-war methods and installing "progressive production" methods, but it is stated that there are 216,000 plants in the United States now using handling methods which would be considered obsolete in any modern automobile factory.

High wages and labor shortage, combined with the demand for increased output, are cited as reasons for revolutionizing production methods in these factories.

COMPANY REORGANZIED

LANSING, MICH., April 10—New capital and new blood has been put into Melling Forging Co. and extensive expansion plans have been outlined. The former board and officers resigned, and in their places the following were elected: J. W. Wilford, president; George Melling, vice-president and general manager; E. C. Shields, secretary; H. J. Sproat, treasurer. The officers and W. H. Newbrough constitute the board, assuming their duties immediately. Edward VerLinden, general manager of Olds Motor Works, also is interested in the company.